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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

ANTENNA GROUPS OA-4040/FPS-69 AND OA-6957/FPS-71

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HEADQUARTERS, DEPARTMENT OF THE ARMY
FEBRUARY 1966

WARNING

Be careful when working on the 120/208-volt ac line connections. Serious injury or death may result from contact with these terminals.

DON'T TAKE CHANCES!

EXTREMELY DANGEROUS VOLTAGES EXIST IN THE FOLLOWING UNIT

Amplifier, Electronic Control AM–4497/FPS 740 volts.

MICROWAVE RADIATION HAZARD

Do not stand in front of the antenna horn or reflector while the equipment is transmitting. The transmitted energy can cause severe rf burns. Radiation levels extremely dangerous to personnel exist in the radar beam up to the distances indicated in the parent radar set manuals.

TECHNICAL MANUAL
No. 11–5840–292–15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *25 February 1966*

Organizational, DS, GS, and Depot Maintenance Manual ANTENNA GROUPS OA–4040/FPS–69 AND OA–6957/FPS–71

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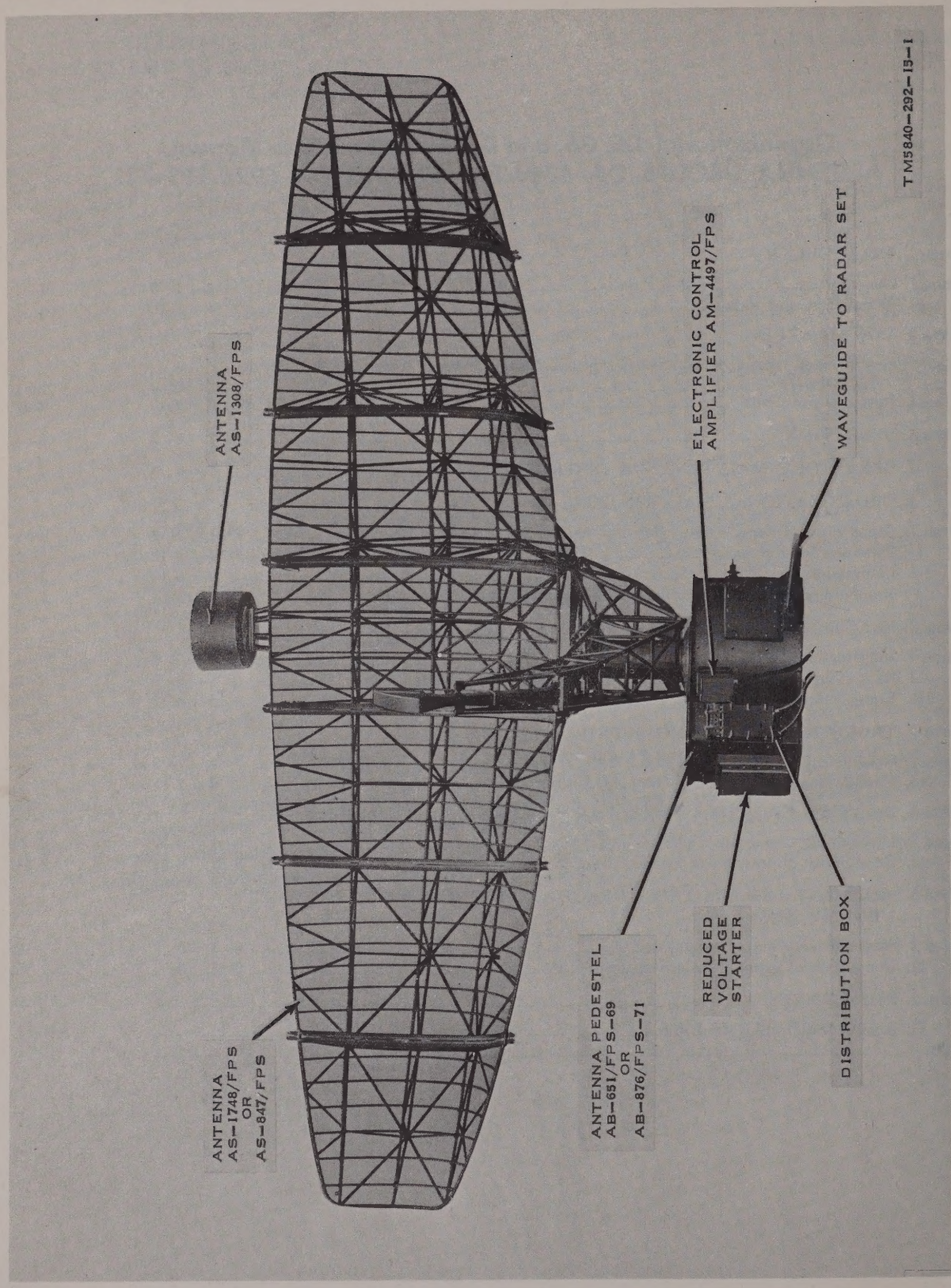


Figure 1-1. Antenna Groups OA-4040/FPS-69 and OA-6957/FPS-71.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1–1. Scope

This manual contains instructions for the installation, operation, maintenance, and repair of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 (fig. 1–1). Changes resulting from the following modifications work orders have been included in this manual: MWO 11–5840–201–30/3, MWO 11–5840–252–30/4, MWO 11–5840–252–30/5, MWO 11–5840–265–30/3, MWO 11–5840–201–30/1, Change 1.

1–2. Index of Publications

Refer to the latest issue of DA Pam 310–4 to determine whether there are new editions, changes, or additional publications pertaining to this equipment. DA Pam 310–4 is an index of current technical manuals, technical bulletins, supply manuals, supply bulletins, lubrication orders, and modification work orders available through publications supply channels. The index lists the individual parts (–10, –20, –35P etc) and the latest changes to and revisions of each equipment publication.

1–3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38–750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700–58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71–4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvements. This form will be completed by using pencil, pen, or typewriter and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-(NMP)-MA, Fort Monmouth, N.J., 07703.

Section II. DESCRIPTION AND DATA

1–4. Purpose and Use

a. General. Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 are large high-gain, high-power antennas, with associated components, designed for use with fixed radars (parent radar). These antenna groups can be installed and secured to a concrete slab or mounted on a tower. Waveguide assemblies are furnished to make up a waveguide run of 20 feet. For installations where the waveguide runs exceed 20 feet, additional waveguide must be requisitioned. The antenna group can be controlled from a remote position. The antenna groups are used with air search radars for acquisition of aircraft and other targets through a complete 360° (6,400 mils) of azimuth. Antenna positioning data are available for use by the Improved Nike-Hercules Air Defense Guided Missile System, the parent radar, and the control console.

b. Differences in Models. Antenna Group OA–4040/FPS–69 is the same as Antenna Group OA–6957/FPS–71 except for the differences listed in paragraph 1–6. Unless otherwise stated, all references throughout this manual refer to both antenna groups.

c. Coverage. The main antenna is a parabolic-reflector-type antenna used for *transmitting and receiving* high-power radiofrequency (rf) energy. This antenna rotates through 360° at a rate of 6 revolutions per minute (rpm) and produces a narrow concentrated beam that affords good azi-

muth resolution of targets and adequate detection capabilities to the maximum range of the parent radar set. Antenna AS–1308/FPS (reference antenna) is mounted on top of the main parabolic reflector and consists essentially of a three-element, cavity-backed slotted array.

d. Identification Friend or Foe. The antenna has provisions for operation with identification friend or foe (IFF) equipment which electronically interrogates detected aircraft to determine whether or not they are friendly.

1–5. Technical Characteristics

This paragraph contains general technical characteristics pertaining to the antenna groups. Refer to the parent radar manual.

a. Main Antenna.

Azimuth scanning	360° continuous clockwise at 6 rpm ±1.
Reflector	Parabolic section, 40 feet wide.
Azimuth position synchro	24-speed, 400-cycle, type 31TX4; and 1-speed, 60-cycle, type 5HG.
Azimuth position resolver	1-speed, 4-kilocycle, type 23R3N4.
Rf input connection	Waveguide Flange UG–418A/U.
Weight of pedestal and reflector	9,057 pounds.
Power requirements	120/208 volts ac ±5 percent, 60 cycles ±4 percent, 4-wire, 3-phase, 27 kilowatts.
Heaters	11.5 kva.
Motors and control circuits (average)	16.5 kva.

Note. Momentary starting loads may exceed the power requirements given above.

b. Reference Antenna.

Radiating element	Three-element, cavity-backed slotted array.
Weight, antenna and mount	110 pounds.

1–6. Table of Components

Note. This listing is based on the original shipment by the contractor on Order No. 17350–PP–63–BA–BA. For the current official listing of components, see the basic issue items list in the parent radar manual.

Components	Quantity		Height (in.)	Depth (in.)	Length (in.)	Volume (cu ft)	Unit weight (lb)
	OA–4040/FPS–69	OA–6957/FPS–71					
Antenna AS–1748/FPS	1		194	205	480	11,040	1,322
Antenna AS–847/FPS		1	194	205	480	11,040	1,322
Antenna Pedestal AB–651/FPS–69	1		126	111	94	762	7,370
Antenna Pedestal AB–876/FPS–71		1	126	111	94	762	7,420
Antenna AS–1308/FPS	1	1	28	43	43	23.4	110
Amplifier, Electronic Control AM–4497/FPS.	1	1	17	18 5/16	15	2.7	35
Reduced voltage starter, Unit No. 13	1	1	30	9	24	3.72	270
Waveguide Assembly CG–1435/FPS–19.	2	2	14 1/4	14 1/4	5 1/2	0.65	4.9
Waveguide Assembly CG–1436/FPS–19.	2	2	11 5/8	11 5/8	8 3/4	0.69	4.2
Waveguide Assembly CG–1512/U (3 ft).	1	1	5 1/2	8 1/4	36	1	16
Waveguide Assembly CG–1513/U (10 ft).	2	2	5 1/2	8 3/4	120	3.3	22.2
Gasket for waveguide flange	8	8	3/16	5.44	8.68	0.005	0.2
Hexagonal nuts, nonmagnetic, CRES, 5/16-inch by 18.	80	80					
Hexagonal capscrews, nonmagnetic, CRES, 5/16-inch by 18 by 1 1/8-inch long.	80	80					
Spring lockwasher, nonmagnetic, CRES, 5/16-inch.	80	80					
Electrical power cable assembly W80*	1	1					
Measuring rod assembly E809	1	1					

* Cable length varies as determined by tower height.

1–7. Nomenclature Assignments and Common Names

A list of nomenclature assignments for the components of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 is given below. A common name is indicated for each component.

Nomenclature	Common nanme
Antenna Group OA–4040/FPS–69	Antenna group
Antenna Group OA–6957/FPS–71	Antenna group
Antenna Pedestal AB–651/FPS–69	Antenna pedestal
Antenna Pedestal AB–876/FPS–71	Antenna pedestal
Antenna AS–1748/FPS	Main antenna
Antenna AS–847/FPS	Main antenna
Antenna AS–1308/FPS	Reference antenna
Amplifier, Electronic Control AM–4497/FPS	Resolver amplifier
Electrical power cable assembly W80 *	Power input cable
Waveguide Assembly CG–1436/FPS–19	90° E-bend
Waveguide Assembly CG–1435/FPS–19	90° H-bend
Waveguide Assembly CG–1512/U (3 ft)	Flexible waveguide
Waveguide Assembly CG–1513/U (10 ft)	Waveguide

* Cable assembly length varies as determined by tower height.

1–8. Description of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71

(fig. 1–1)

Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 are large high-gain antennas. Antenna Group OA–4040/FPS–69 consists of Antenna AS–1748/FPS, Antenna Pedestal AB–651/FPS–69, Antenna AS–1308/FPS, Amplifier, Electronic Control AM–4497/FPS, a power input cable, waveguide assemblies to assist in connecting this equipment to the radar set, suitable hardware for assembling the waveguide run, and the necessary running spares. Antenna Group OA–6957/FPS–71 consists of Antenna AS–847/FPS, Antenna Pedestal AB–876/FPS–71, Antenna AS–1308/FPS, Amplifier, Electronic Control AM–4497/FPS, a power input cable, waveguide assemblies to assist in connecting this equipment to the radar set, suitable hardware for assembling the waveguide run, and the necessary running spares.

a. Antennas AS–1748/FPS and AS–847/FPS. The

main antenna is a large parabolic-reflector antenna for transmitting and receiving signals in the 1,250- to 1,350-megacycle (mc) range. It consists of a reflector, a feed horn assembly, and support assemblies for the reflector and feed horn. The reflector and feed horn are secured to their support assemblies which, in turn, are bolted to the rotating column on top of the main-antenna pedestal. A dipole radiator located inside the feed horn is used as an IFF antenna when IFF equipment is used in conjunction with the parent radar set. The reflector, a 40-foot-long truncated parabolic section, is comprised of seven sections so that it may be readily transported. The antenna horn and connecting waveguide sections to the top of the rotary joint are pressurized at 5 pounds in Antenna AS–1748/FPS. These same waveguide and horn portions in Antenna AS–847/FPS are not pressurized.

b. Antenna AS–1308/FPS. This antenna is mounted on the main antenna. The reference antenna consists of a three-element, cavity-backed, slotted array and is protected with a fiberglass radome to prevent dust, debris, or other foreign matter from entering the array. The reference antenna receives radar interference signals from the same direction as the sidelobes of the main antenna are pointing.

c. Antenna Pedestal AB–651/FPS–69 and Antenna Pedestal AB–876/FPS–71. The main-antenna pedestal serves as the support and driving assembly for the main and reference antennas. The upper, rotating portion of the pedestal supports the antenna. The lower, stationary portion of the pedestal contains the antenna drive (rotating) mechanism and its pressure lubricating system. The detail parts and wiring, located in the lower portion of the pedestal, are inclosed in a splashproof aluminum skin. The rotating joint and waveguide transitions that run vertically through the pedestal couple the radar signal, the IFF signal, and the reference signal from the rotating main antenna to the stationary portion of the antenna group. Mounted on the lower portion of the pedestal are three rectangular metal boxes: the pedestal distribution box, the resolver amplifier, and the reduced voltage starter.

(1) *Pedestal distribution box.* The pedestal distribution box contains control relays, fuses, fuse indicators, cable connection facilities, a safety switch for the main antenna, and two 115-volt, 60-cycle convenience outlets.

(2) *Resolver amplifier.* On the outside of the resolver amplifier are one cable connection and a phone jack. The resolver amplifier relays main-antenna position information to the Improved Nike-Hercules Air Defense Guided Missile System. Means are provided for aligning the Nike plan position indicator (ppi) sweep position with the azimuth position of the main antenna. This unit also contains a power supply to provide the necessary operating voltage. The required 115-volt, 400-cycle alternating current (ac) primary power to the resolver amplifier is provided from the parent radar set.

(3) *Reduced voltage starter.* The reduced voltage starter is mounted on the antenna pedestal and contains control relays, a time delay relay, a three-phase tapped autotransformer, a fuse and fuse indicator, and overtemperature interlock relays and switches. The reduced voltage starter is used to start the antenna rotating with a preset reduced voltage level, thus limiting the surge current at the initial start period. Approximately 10 seconds after the rotate switch is set to the run position, full voltage is applied for normal operating speed of 6 rpm.

1–9. Description of Minor Components
(fig. 1–2)

The minor components of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 include cables, waveguide lengths and bends, gaskets, and the necessary assembling hardware (para 1–6). The waveguides, hardware, and gaskets are used to connect the rf output of the parent radar set to the rf input flange of the antenna group.

a. Electrical Power Cable Assembly W80. The power imput cable contains four stranded insulated No. 4 AWG conductors within a cotton braid, and a neoprene sheath. The four conductors are color-coded black, white, red, and green. One end of the outer covering is stripped back approximately 16 inches and a size M 45° stuffing tube is installed. On the other end, the outer covering is stripped back 12 inches. Solder-type terminal lugs are at-

tached to both ends of each conductor. Suitable identifying tags are attached to the cable and each conductor. The overall length of this cable will vary between installations, and its length will be governed by the height of the antenna tower.

b. Radiofrequency Cable Assembly W60. Cable W60 is of the semirigid coaxial type, 17 feet 10 inches long, with a $\frac{7}{8}$ EIA female fitting on each end. The cable connector, identified as P1, connects to a male-to-male EIA adapter (CP1001) which is attached to the reference antenna; the connector on the other end of the cable, marked P807, connects to a right-angle EIA adapter (CP1000) on the top of the rotary joint.

c. Waveguide Assembly CG–1435/FPS–19. Two of these assemblies are furnished (W514 and W515) to make 90° bends in the H-plane of the waveguide run.

d. Waveguide Assemblies CG–1436/FPS–19. Two of these assemblies are furnished (W512 and W513) to make 90° bends in the E-plane of the waveguide run.

e. Waveguide Assembly CG–1512/U (3 ft). This is a 3-foot length of flexible waveguide (W511) for use in the waveguide installation where slight bends are required.

f. Waveguide Assembly CG–1513/U (10 ft). Two of these assemblies are furnished (W516 and W517) to connect the antenna group to the parent radar set. One or both may be used and, in some installations, additional waveguide may be needed, depending on the distance between the parent radar set and the antenna group.

g. Waveguide Windows, Gaskets, and Hardware. Two waveguide windows and a sufficient number of waveguide gaskets (rubber bonded to a metal frame) are furnished for use between the waveguide flanges and windows. Hexagonal-head capscrews, lockwashers, and nuts are provided to fasten the waveguide assemblies together. These are made of nonmagnetic, corrosion-resistant steel.

Note. In Antenna Group OA–4040/FPS–69, one of the waveguide windows contains a pressure-reduction regulator.

h. Measuring Rod Assembly E809. A measuring rod assembly is furnished to check for proper positioning of the antenna horn with respect to the reflector. This device consists of telescoping aluminum tubes adjustable to three different lengths and secured together with a captive taper pin. The ends of this measuring rod are fitted with spherical tips which mate with similar sockets on the antenna horn and the center section of the reflector. One end of this device is spring loaded and may be retracted against a compression spring up to a maximum of 1 inch.

i. Special Tools. The following special tools are furnished with the 40-foot antenna:

(1) Two special thin $1\frac{3}{4}$-inch open-end wrenches are furnished with the antenna group. These wrenches are used to assemble the sections of the antenna reflector.

(2) Three special wrenches are supplied with Antenna Group OA–6957/FPS–71 only, to facilitate disassembly and reassembly of the rotary joint. These wrenches are a socket-head wrench (0.1391 in. across flats), a $1\frac{1}{4}$-inch open-end wrench, and a $1\frac{1}{2}$-inch open-end wrench.

(3) A funnel is furnished to facilitate pouring lubricating oil into the oil sump during the initial filling, or adding oil.

(4) A 2-foot length of $\frac{3}{4}$-inch hose is furnished to facilitate draining the lubricant from the oil sump.

(5) A caulking gun and associated cartridges are furnished for use in sealing the seams between the two half-cover sections on the top of the pedestal to insure a watertight fit.

(6) Six $\frac{1}{4}$-inch by 20 by 3-inch screws with wingnuts are furnished to facilitate removal of the triple-channel rotary joint.

(7) Two lubricating fittings are furnished to facilitate greasing operations. One fitting is straight and the other is angled at 65°. Both fittings have a $\frac{1}{8}$-inch by 27 pipe thread.

(8) Pressurizing Kit HD–51/GT is used to connect the gas cylinder to the pedestal.

Note. Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 are both pressurized with dry air which is supplied by the parent radar set.

1–10. Additional Equipment Required

It is required that the rf rotary joint in both Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 be pressurized at 15 pounds-per-square-inch gage (psig) and that the waveguide run from

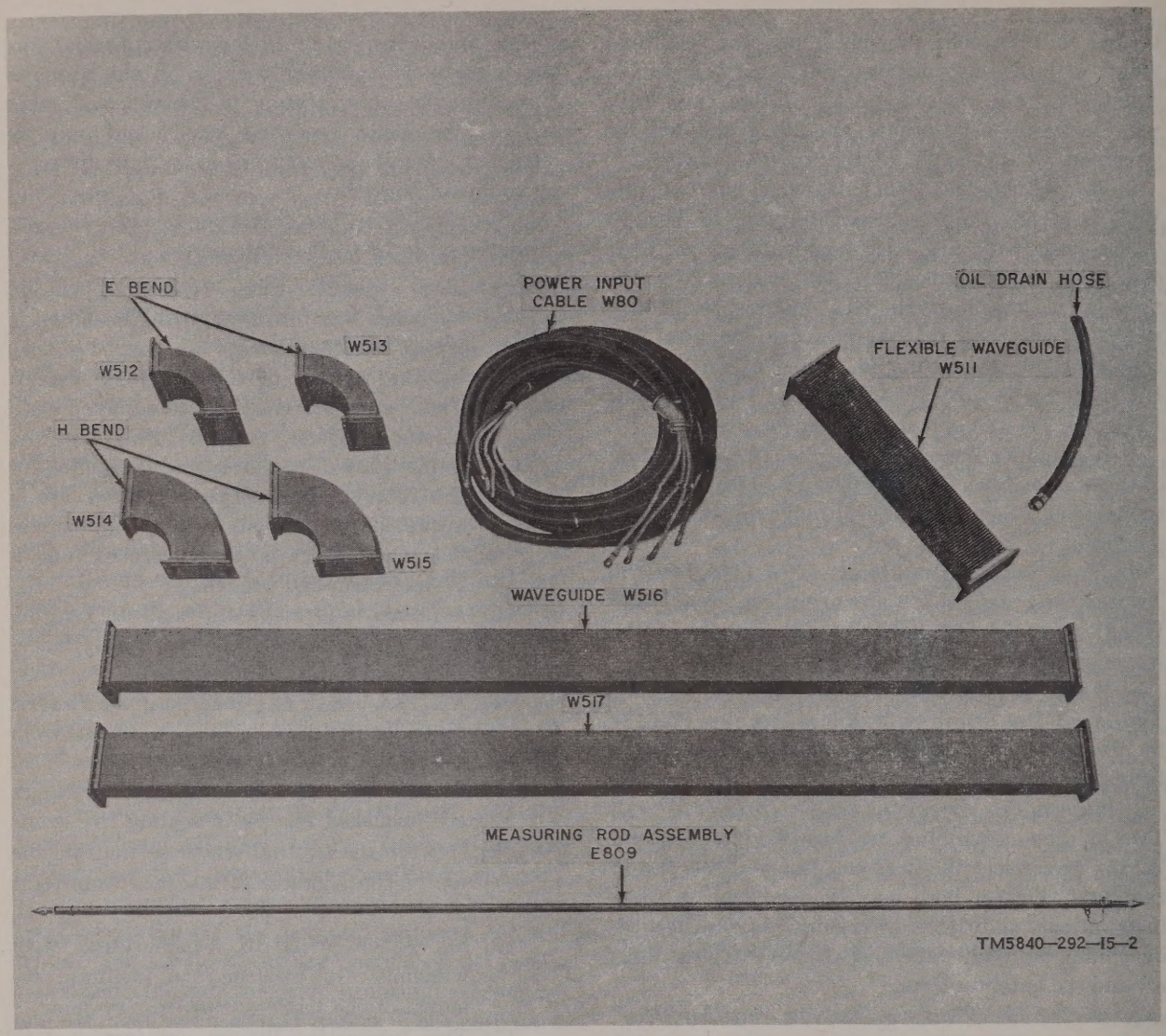


Figure 1–2. Minor components.

the top of the rotary joint to the horn in Antenna Group OA–4040/FPS–69 be pressurized at 5 psig (via a pressure reduction regulator on the main antenna). The parent radar set associated with the antenna groups supplies the necessary dry air for accomplishing the required pressurization.

CHAPTER 2

INSTALLATION

Section I. SERVICE UPON RECEIPT OF ANTENNA GROUP OA–4040/FPS–69 OR ANTENNA GROUP OA–6957/FPS–71

2–1. Siting

a. General. Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 are large heavy equipments that require a specially built foundation or tower at the installation site. The choice of installation sites should be based on the area to be searched, the height of the antenna, the availability of an area suitable for the construction of the foundation or tower, the surrounding terrain, and the availability of suitable electrical power.

b. Antenna Height. The height of the antenna reflector assembly above the surrounding terrain is an important factor in determining the maximum operating range of the radar. A radar set with an antenna located well above the surrounding terrain should produce target detection at greater distances than one with a lower antenna. Typical antenna tower heights that will be encountered with these antenna groups range from 18 feet 4 inches to 58 feet 4 inches, in 10-foot steps. The tower heights are in increments of 10-foot intervals to facilitate the use of standard 10-foot waveguide sections.

c. Distances Relative to Radar Shelter. For best results, there should be minimum waveguide between the radar set and the antenna. Consult the parent radar set manual relating to the MICROWAVE RADIATION HAZARD warning for the minimum safe distances from the antenna. The minimum safe distances will establish the antenna height above the radar shelter and the antenna distance away from the radar shelter.

2–2. Unpacking New Equipment

When the antenna group is received, select a location for unpacking as close to the permanent installation site as possible. A crane, forklift truck, or other suitable lifting equipment must be available for handling the 8,300-pound (approximate) pedestal.

a. Packaging Data. Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 are placed in cartons and packed in boxes. The pedestal, antenna reflector assemblies, and the rotary joint are packed in crates. Typical box numbers, dimensions, weight, and contents are shown in the chart below. The same case number does not always contain the same material. Check the packing list.

Case No.	Height (in.)	Width (in.)	Depth (in.)	Volume (cu ft)	Total weight (lb)	Contents
1	146	91	75	576.7	1,290	Reflector center section.
2	147	93	76	601.3	1,170	Right-hand reflector section No. 2.
3	147	93	76	601.3	1,170	Left-hand reflector section No. 2.
4	130	93	69	482.2	800	Right-hand reflector section No. 3.
5	130	93	69	482.2	800	Left-hand reflector section No. 3.
6	105	80	42	204.2	510	Right-hand reflector section No. 4.
7	105	80	42	204.2	510	Left-hand reflector section No. 4.
8	101	84	51	250.4	665	Reflector support.
9	162	68	45	286.9	695	Horn-support assembly. Horn. Waveguide twist. Waveguide bend. Radio Frequency Cable Assembly CG–1514/U (11 ft). Measuring rod assembly.

Case No.	Height (in.)	Width (in.)	Depth (in.)	Volume (cu ft)	Total weight (lb)	Contents
10	107	113	95	664.7	8,825	Antenna Pedestal AB–651/FPS–69 or AB–876/FPS–71.
11	33	27	11	5.8	147 [a]	Waveguide gaskets (10).
						Hardware group for fastening waveguide flanges.
						Electrical power cable assembly W80[a].
						Lubricating fittings (2).
						Running spares for Amplifier, Electric Control AM–4497/FPS.
						Running spares for Antenna Pedestal AB–651/FPS–69 or AB–876/FPS–71.
						Caulking gun and two caulking compound cartridges.
						¼-inch by 20 by 3-inch screws and wingnuts (6).
						Funnel.
						Waveguide window and pressurizing regulator[b].
12	127	18	15	19.9	140	Waveguide Assembly CG–1513/U (10 ft) (2)[c].
13	42	33	26	20.1	160	Hardware mounting group.
						Open-end wrench (2).
						Drain hose.
						Waveguide Assembly CG–1512/U (3 ft).
						Waveguide Assembly CG–1436/FPS–19 (2).
						Waveguide Assembly CG–1435/FPS–19 (2).
						Radio Frequency Cable Assembly CG–1514/U (50 ft).
						Radio frequency cable assembly W60.
						Special wrench (3)[d].
						Manual.
14	36	30	12	7.5	300	Reduced voltage starter.
15	156	12	12	11.4	62	Rotary joint.
16	-------	------	------	--------	--------	Pressurizing Kit HD–51/GT.
17	50	50	35	50	340	Antenna AS–1308/FPS.
18	20	22	42	10.7	85	Support, P/O Antenna AS–1308/FPS.
						Kit, banding, for use with cable W60.
						Adapter, ⅞ EIA (right-angle).
						Adapter, ⅞ EIA-HN (2).
						Adapter, ⅞ EIA–⅞ EIA (gas barrier).
19	26	15	15	3.5	117	Can of oil (5 gal. ea) for use with 40-foot antenna.
20	26	15	15	3.5	117	Can of oil (5 gal. ea) for use with 40-foot antenna.
21	26	15	15	3.5	117	Can of oil (5 gal. ea) for use with 40-foot antenna.

[a] Length and weight varies as determined by tower height.
[b] Antenna Group OA–4040/FPS–69 only.
[c] Additional waveguide assemblies may be on hand, depending on the height of the antenna tower.
[d] Antenna Group OA–6957/FPS–71 only.

b. Uncrating Pedestal.

(1) Remove the lag screws and nails, and remove the top and sides of the packing crate (fig. 2–1).

(2) Remove the bolts that attach the pedestal to the shipping skid, and remove the packing material from around the pedestal. Align the pointer on the side of the rotor assembly (approximately 3 in. above the azimuth scale) with the azimuth scale pointer (175, fig. 8–9) located on top of the pedestal cover half section. To align the pointers, remove the cover (13, fig. 8–2) on the side skin and turn the motor by hand; this will turn the rotor assembly.

(3) Use the two lifting eyes at the top of the rotor assembly (fig. 2–2) to lift the uncrated pedestal from the shipping skid.

Caution: **Do not attempt to lift the pedestal by the lifting eyes on top of the rotor assembly until the pointers have been aligned. The alignment locates the pedestal center of gravity so that the pedestal will lift squarely.**

c. Uncrating Reflector and Horn-Support Assembly. Unpack the reflector support, the reflec-

tor sections, and the horn-support assembly as needed for installation (para 2–7). Use a nail-puller to remove the nails; do not pry off the tops and sides of the cases because this may damage the equipment.

d. Uncrating Waveguide Sections. Unpack the waveguide sections as needed to prevent possible damage to the parts. Be careful in unpacking and handling the waveguide sections; physical damage to these parts can prevent proper operation of the equipment.

e. Uncrating Reference Antenna and Support. Unpack these parts as needed to prevent possible damage. Be careful when unpacking the reference antenna. It is protected with a radome material and any physical damage can prevent proper operation of the equipment.

f. Uncrating Rotary Joint Assembly. This assembly is very delicate and requires careful handling. Do not unpack it until ready for installation. To gain entrance to this crate, remove the wood screws that hold the top cover to the crate, and then remove the wood screws that hold the blocking and securing material inside the crate. Do not use a hammer or ripping bar to gain entrance to this crate.

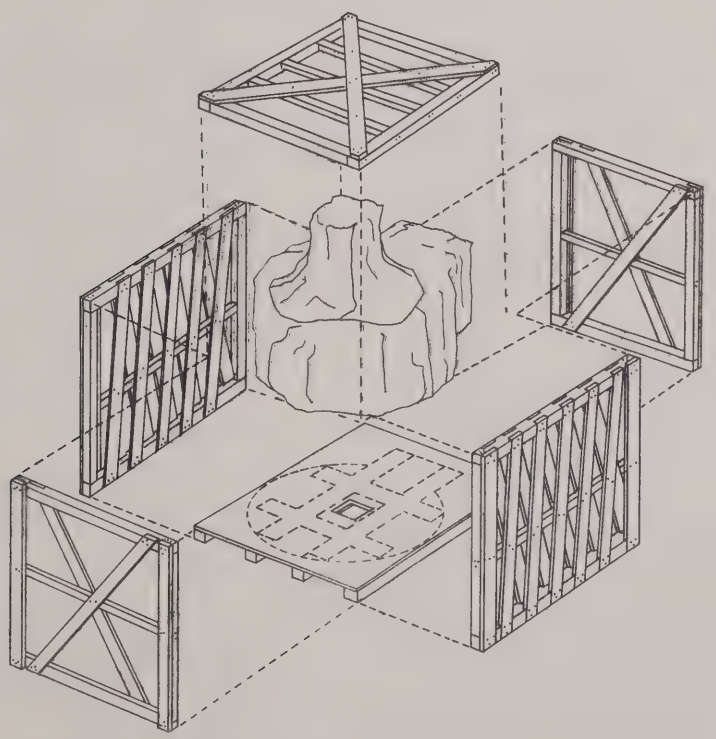
2–3. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, refer to paragraph 1–3.

b. See that the equipment is complete as listed on the packing slip. If the packing slip is not available, check the equipment against the packaging data (para 2–2).

2–4. Installation of Pedestal

The size and weight of the antenna group and the force of windloading on the main antenna reflector require the construction of a suitable foundation before the equipment is installed. Recommended specifications for a reinforced concrete foundation that is adequate for the antenna group are given in *a* below. For the construction details for tower installations, consult: Department of the



TM5047-4

Figure 2–1. Typical packing.

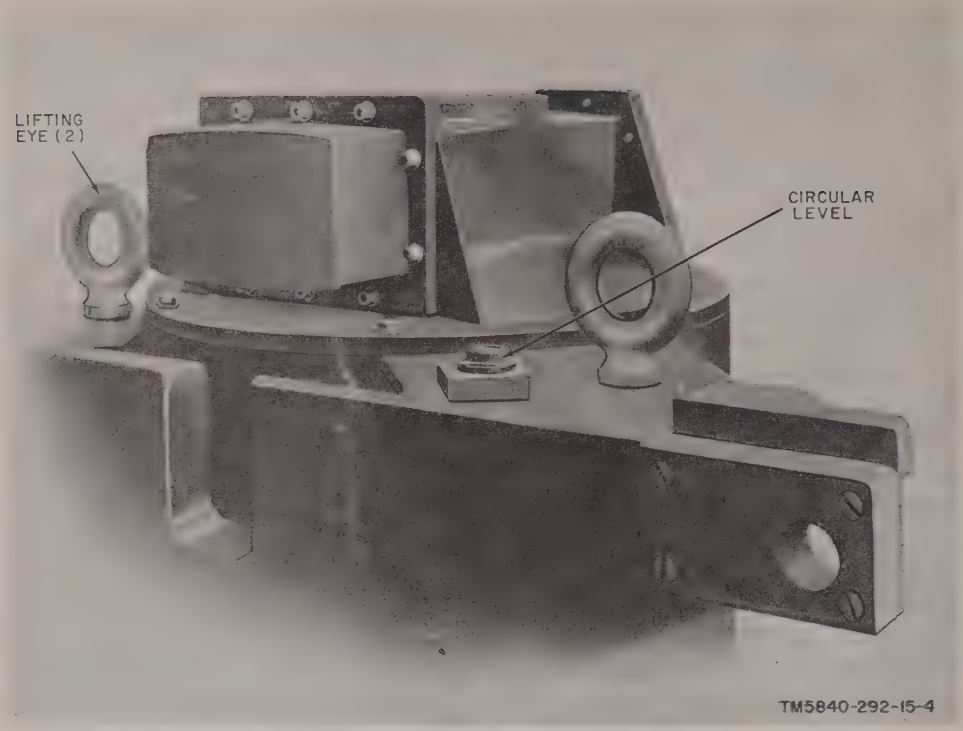


Figure 2–2. Circular level.

Army, Office of the Chief of Engineers, Military Construction Engineers Division, Washington D. C. in relation to ARMY DEFENSE PROGRAM, MODIFIED EMERGENCY CONSTRUCTION, ABAR TOWERS.

Note. Before construction of an antenna support, whether it be of concrete or tower design, consider the MICROWAVE RADIATION HAZARD warning in the parent radar set manual.

a. Foundation Specifications.

(1) Minimum size: 11 by 11 feet by 4 feet deep. The depth of the slab in the earth is subject to frost conditions; it should extend at least 1 foot below the frostline. In extremely cold climates, the depth of the slab in the earth should extend at least 1 foot below the thaw line. The specifications indicate only the minimum size of the pedestal foundation, provided the main antenna reflector clears the top of the radar shelter. (See fig. 2–3 for dimensions.) The actual size of the foundation will be determined by the local conditions.

(2) Reinforcement: $\frac{1}{2}$-inch diameter rods in both directions, on 8-inch centers.

(3) Rotary joint access: It is necessary to provide an opening of 24 inches in diameter by 30 inches in depth, and access to the underside of the pedestal for servicing the bottom of the rotary joint.

Note. These requirements can be met by a solid foundation with a 24-inch-wide passageway through the center, or by 10-inch-thick reinforced walls with a 10-inch-thick reinforced platform and access to the underside of the platform. Adequate footings below the frost level must be used.

(4) Holddown bolts: twenty 1-inch by 8 J-bolt, $24\frac{1}{2}$ inches long, embedded in a concrete slab within $\frac{1}{16}$ inch of true position, as shown in figure 2–3.

Note. If a concrete-platform-style foundation or tower is used, twenty 1-inch by 8 bolts (the length to be determined by whether a concrete platform or a tower is used) are required to secure the pedestal in place.

(5) Concrete: Use 1–2–3 mix concrete, 25,000 pounds per square inch in 28 days.

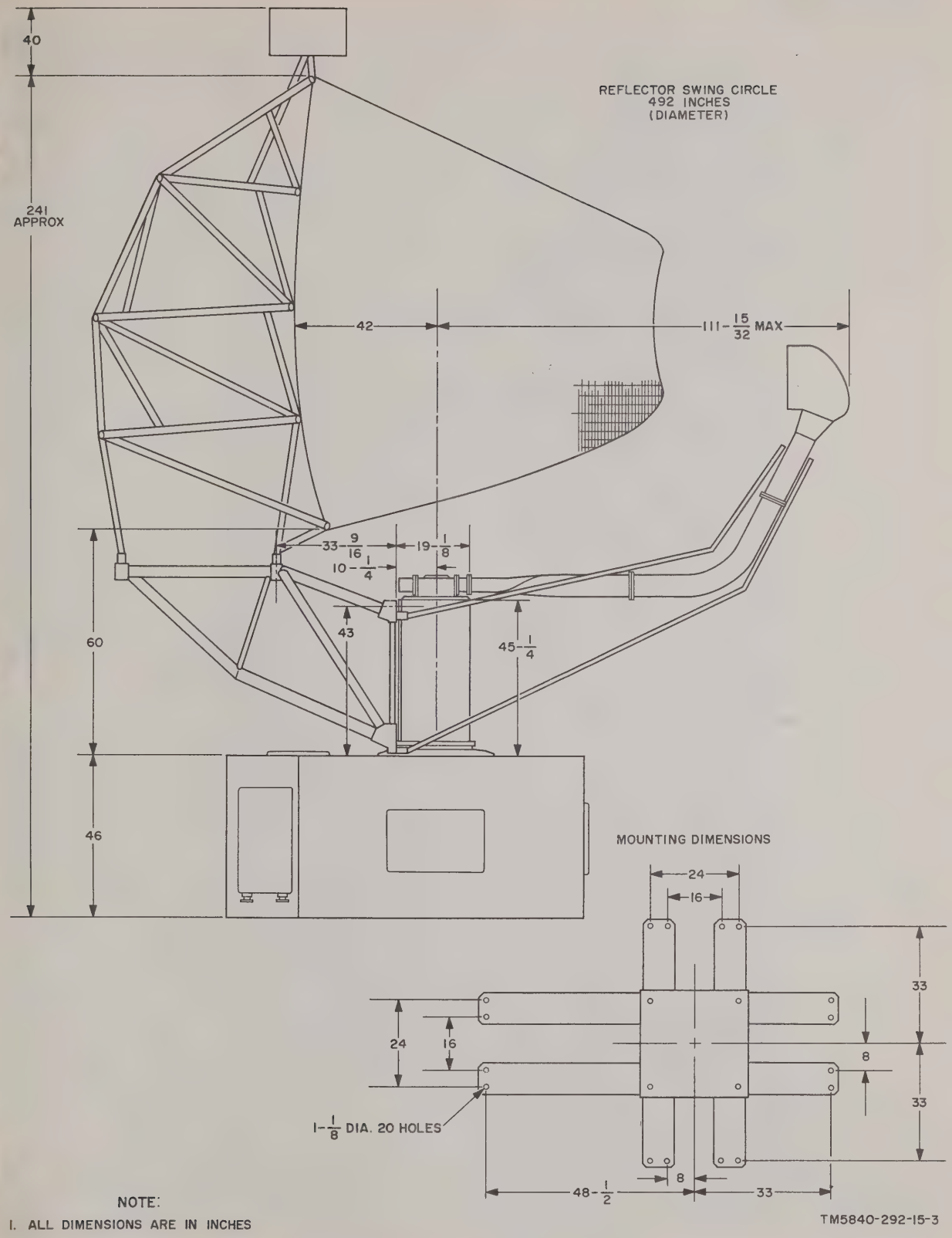


Figure 2-3. Pedestal dimensions.

b. Installation Procedure.

(1) Place the antenna pedestal in position on the concrete slab with the J-bolts up through the holes in the I-beams of the support base, or align the holes in the I-beam of the support base with bolt holes in the concrete platform or tower.

(2) Install flat washers and nuts on the bolts. Before tightening the nuts securely, level the pedestal with suitable metal shims. Use the circular level (fig. 2–2) at the top of the rotor assembly to determine the level condition of the pedestal.

(3) Rotate the rotor assembly by hand-turning the motor coupling, and check the level at four points, 90° apart.

c. Rotary Joint Pressurizing. Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 operate at a power level that requires the waveguide run and rotary joint to be pressurized at all times. Typical radar set installations provide a source of dry air at a pressure level of 15 psig for pressurizing the necessary components in the antenna group. An alternate pressurizing system using a dry-air cylinder is available in lieu of the dry air supplied by the parent radar set. If it is necessary to pressurize the antenna group, and the normal dry-air supply from the parent radar set is not available, perform the following procedure:

(1) Attach a cylinder of dry air to the pedestal. Use the bracket and clamp on the skin of the pedestal (fig. 2–4).

(2) Connect the dry-air cylinder to the pipe-to-flare tube fitting (278, fig. 8–16).

(3) See that the pressure gage (276, fig. 8–16) reads a minimum of 15 psig.

***Caution:* A maximum pressure of 20 psig in the rotary joint must not be exceeded.**

2–5. Antenna Pedestal AB–876/FPS–71 Rotary Joint Installation

(fig. 9–10)

A portion of the rotary joint was removed prior to shipping to facilitate crating the antenna pedestal and to protect the protrusion beyond the bottom of the pedestal against damage. The following procedure for installing the rotary joint requires a working crew of three men and at times entails simultaneous operations at the upper and lower ends of the rotary joint. Carefully uncrate the rotary joint and disassemble it preparatory to installation.

a. Installation Procedure of Transmission Line Sections.

(1) Using a clean dry cloth and a long wooden stick, clean the inside of the conductor conductor tube (129, fig. 8–8). Roll the cloth into a ball and use the stick to push the ball through the conductor tube.

(2) Carefully lower the main rf transmission line section (38, fig. 9–10) with the reference and IFF rf transmission line sections (24 and 25) inside, through the center of the upper and lower main transitions. Reach in through the open end of the waveguide transition (57) to assist in guiding the line sections through the center of the lower main transition (55).

(3) Insure that the two preformed O-rings (63) are in the two grooves inside the collar bearing (62) and that they are in good condition.

(4) Place the ball bearing (64) on the collar bearing (62) and fasten in place with the external retaining ring (65).

(5) Slide the positioning spacer (61) over the end of the rf line sections so that the flat surface is against the polyiron spacer (60). Slide the collar bearing (62) and attaching parts over the end of the rf line section so that the widest diameter is toward the positioning spacer (61). Secure this assembly in place with the retaining ring (66) which fits into a groove in the lower bearing housing (58) and rests against the ball bearing (64).

(6) On the upper portion of the rotary joint, position the sleeve bearing halfset (47) around the main rf transmission line section (38) and place against the polyiron spacer (48) in the top of the upper bearing housing (50). If necessary, raise the main rf transmission line section (38) to facilitate installation.

(7) Secure the sleeve bearing halfset in place with the retaining ring (46) which fits into a groove in the upper bearing housing (50).

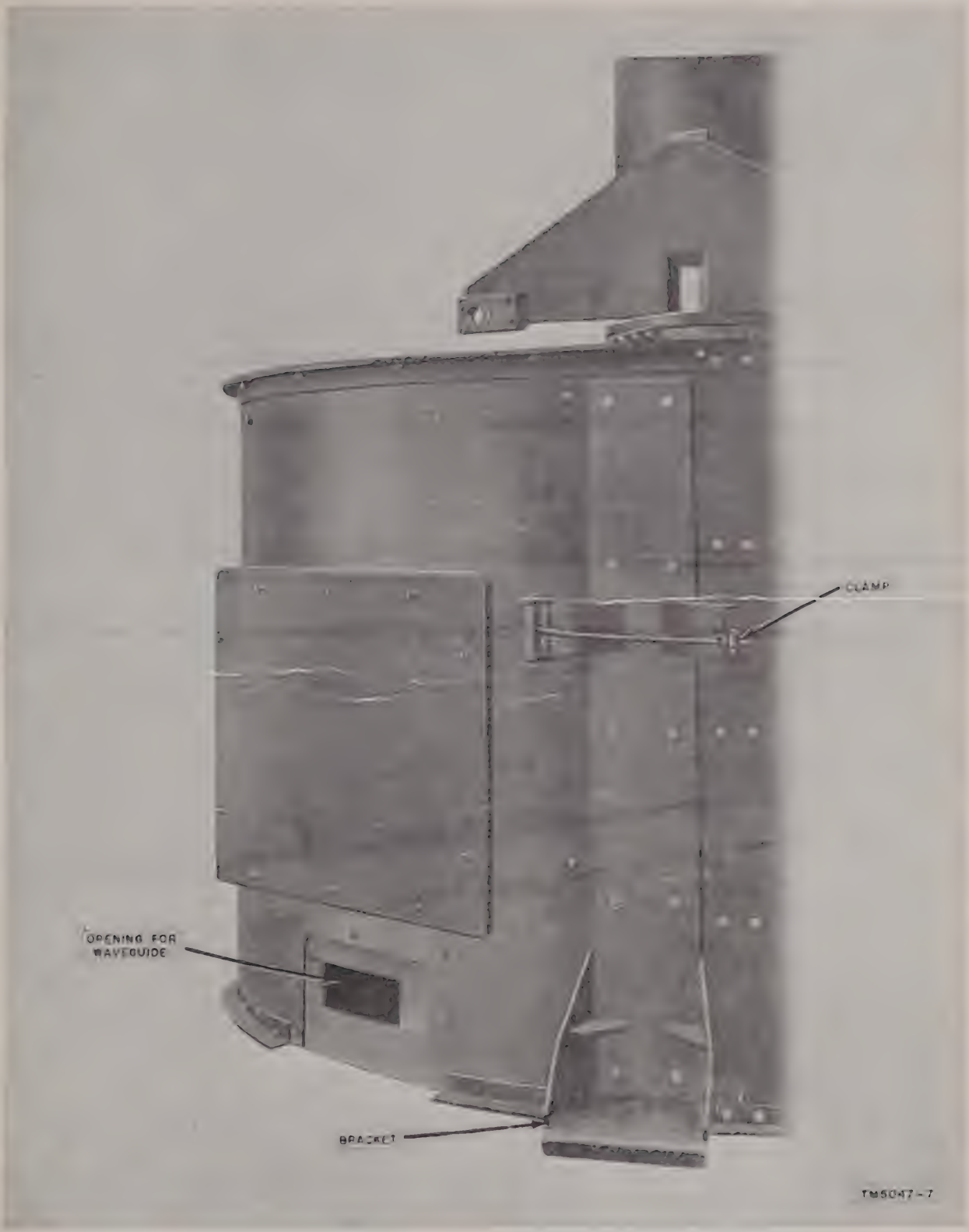


Figure 2–4. Dry-air cylinder mounting.

b. Installation Procedure of Lower Rotary Joint Parts.

(1) Place the locking nut (83), serrated lockring (85), and locking ring (86) over the end of the rf line section, in the order mentioned. Place the main transmission line retainer flange (87) and mate it with the bottom end of the main rf transmission line section (38); make certain that the end of the line section butts against the recessed seat in the main transmission line retainer flange (87). Secure the main rf transmission line section (38) to the main transmission line retainer flange (87) with the locking ring (86), serrated lockring (85), and locking nut (83). When tightening this assembly, use a $1\frac{1}{4}$-inch open-end wrench on the main transmission line retainer flange (87) and a $1\frac{1}{2}$-inch open-end wrench on the locking nut (83). Do not use pipe wrenches or pliers when assembling these parts.

(2) Secure the locking nut (83) to the main transmission line retainer flange with three 8 by 32 by $\frac{1}{4}$-inch socket-head setscrews (84).

(3) Position the rubber gasket (74) on the smaller flange of the adapter (78). Orient the adapter (78) for convenient connection of the air line to the pipe-to-tube adapter (79), and fasten the adapter (78) to the lower flange housing (69) with six $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (77), $\frac{1}{4}$-inch lockwashers (76), and $\frac{1}{4}$-inch flat washers (75).

(4) Place the sleeve (95) into the top of the conductor housing (99), and make certain that it rests against the machined seat.

(5) Place the sleeve bearing (94) into the top of the conductor housing (99), and check for proper seating.

(6) Place the retaining ring (92) into the groove around the inside upper portion of the conductor housing (99).

(7) Position the ball bearing (91) on the upper choke (93), and secure it with the external retaining ring (90).

Note. Provided all of the original parts were used together in the same rotary joint, proceed with the instructions given below. However, if the choke assembly (105) and the choke body (108) have been disassembled and replacement of either or both parts is required, or if the ball bearing (91), the conductor housing (99), or the upper choke (93) is replaced because of damage in transit, perform the special disassembly and calibrating procedures outlined in paragraphs 8–8*b* and 8–46*f*.

(8) Carefully mate the upper choke (93) with the main transmission line retainer flange (87) and fasten together with four 10 by 24 by $\frac{5}{8}$-inch socket-head screws (88) and No. 10 lockwashers (89). To facilitate installation, the main rf transmission line section (38) may be lowered until the top flange rests on the sleeve bearing, halfset (47).

(9) Place an O-ring gasket (96) in the groove on the top flange of the conductor housing (99). Rotate the conductor housing (99) so that the IFF jack mates conveniently with the IFF cable. Fasten the conductor housing (99) to the adapter (78) with six $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (98), twelve $\frac{1}{4}$-inch flat washers (97 and 82), six $\frac{1}{4}$-inch lockwashers (81), and six $\frac{1}{4}$-inch by 20 hexagonal nuts (80).

(10) Position the O-ring gasket (107) in the groove on the top side of the choke body (108) flange. Mate the choke body (108) flange with the conductor housing (99). Orient the choke body (108) so that the threaded boss aligns with the IFF jack on the side of the conductor housing. Fasten the choke body (108) to the conductor housing (99); use six $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (110), twelve $\frac{1}{4}$-inch flat washers (109 and 104), six $\frac{1}{4}$-inch lockwashers (103), and six $\frac{1}{4}$-inch by 20 hexagonal nuts (102).

(11) Fasten the lower IFF contact (100) to the threaded boss on the side of the choke body (108), with an 8 by 32 by $\frac{7}{8}$-inch fillister-head screw (101).

(12) Place the spacer insulator (115) on the reference line section contact (114) and fit it into the groove. Place the teflon sleeve (113) into the smaller opening end of the reference line section contact (114).

(13) From the top of the rotary joint, push the IFF rf transmission line section down until the end of the inner conductor is flush with the bottom of the choke body (108). Slide the teflon sleeve (113) end of the reference line section contact over the reference rf transmission line section (24). The flange end of the teflon sleeve (113) should butt against the IFF rf transmission line section (25).

(14) Fit the O-ring basket (112) over the conductor adapter (116), and fasten the connector adapter (116) to the bottom of the choke body (108), using three 10 by 24 by $\frac{5}{8}$-inch fillister-head screws (117). Fastening the connector adapter (116) to the choke body (108) should result in pushing the reference and IFF rf transmission line sections (24 and 25) upward.

c. Installation Procedure of Upper Rotary Joint Parts.

(1) Place the rubber gasket (39) on the top of the upper flange housing (44), and align the two sets of holes.

(2) Place the rubber gasket (37) on top of the top flange on the main rf transmission line section (38), and align the two sets of holes.

(3) Place the drive housing (36), the rubber gaskets (35), and the IFF rf transmission line adapter (28) over the top flange on the main rf transmission line section (38), and align the four sets of holes in each part. Fasten the IFF rf transmission line adapter (28) to the main rf transmission line section (38); use four 8 by 32 by $\frac{3}{4}$-inch socket-head screws (32), No. 8 lockwashers (33), and No. 8 flat washers (34).

(4) Orient the IFF rf transmission line adapter (28) so that IFF jack projection J803 points toward the rf horn. To prevent the drive housing (36) from rotating, temporarily thread a few $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket-head screws (7) through the drive housing (36) and into the upper flange housing (44). Do not attempt to tighten.

(5) Slide the round rubber section seal (27) over the reference and IFF transmission line sections (24 and 25) followed by the packing nut (26). Thread the packing nut (26) onto the IFF rf transmission line adapter (28) until it is handtight. Using the appropriate open-end wrench (not pliers), take 1 complete turn on the packing nut (26). Do not overtighten.

(6) Place the locking nut (23), O-ring gasket (118), internal tapered spacer (22), and slotted sleeve (21) over the reference and IFF transmission line sections 24 and 25) in the order mentioned. Orient the internal tapered spacer (22) so that the flat side is against the O-ring gasket (118) and the internal tapered side is against the slotted sleeve (21). Place the O-ring gasket (20) over the threaded portion of jack J807 (17). Place jack J807 (17) and attached angle adapter (11) over the ends of the reference and IFF transmission line sections (24 and 25). The end of the IFF rf transmission line section (25) should butt against the seat inside jack J807 (17). Orient the EIA type angle adapter (11) so that it points toward the center of the reflector and fasten jack J807 (17) to the IFF rf transmission line section using the O-ring gaskets (20 and 118), slotted sleeve (21), internal tapered spacer (22), and locking nut (23).

(7) Remove the $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket-head screws (7) that were temporarily installed in (4) above. Fasten the two line section guards (1 and 2) through the flange of the drive housing (36) to the upper flange housing (44), using six $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket-head screws (7), $\frac{1}{4}$-inch lockwasher (8), and $\frac{1}{4}$-inch flat washers (9).

2–6. Antenna Pedestal AB–651/FPS–69 Rotary Joint Installation
(fig. 9–9)

A portion of the rotary joint was removed prior to shipping, to facilitate crating the antenna pedestal and to protect the protrusion beyond the bottom of the pedestal against damage. The following procedure for installing the rotary joint requires a

working crew of three men and, at times, entails simultaneous operations at both the upper and lower ends of the rotary joint. Carefully uncrate the rotary joint and disassemble it preparatory to installation.

a. Installation Procedure of IFF and Reference Rf Transmission Line Sections.

(1) Using a clean dry cloth and a long wooden stick, clean the inside of the main rf transmission line section (41). Roll the cloth into a ball and, with the stick, push the ball through the main rf transmission line section.

(2) Carefully lower the IFF rf transmission line section outer conductor (39) (with the IFF and reference rf transmission line sections (26 and 25) inside) through the center of the main rf transmission line section (41).

(3) Slide the flange-type retaining ring (119) over the bottom end of the IFF rf transmission line section outer conductor (39), and secure it in place with the external retaining ring (120).

b. Installation Procedure of Upper Choke, Conductor Housing, Choke Body, and Attaching Parts.

(1) Place the sleeve (136) into the top of the conductor housing (138), and make certain that it rests against the machined seat.

(2) Place the sleeve bearing (135) into the top of the conductor housing (138), and check for proper seating.

(3) Place the internal retaining ring (133) into the groove around the upper inside portion of the conductor housing (138).

(4) Position the ball bearing (132) on the upper choke (134), and secure it in place with the external retaining ring (131).

Note. Provided all of the original parts were used together in the same rotary joint, proceed as instructed below. However, if the choke assembly (147) and the choke body (149) have been disassembled and replacement of either or both parts is required, or if the ball bearing (132), the conductor housing (138), or the upper choke (134) is replaced because of damage in transit. perform the disassembly and special calibrating procedures outlined in paragraphs 8–7*b* and 8–45*f*.

(5) Carefully mate the upper choke (134) with the flange-type retaining ring (119) on the bottom of the IFF rf transmission line section outer conductor (39) and fasten together with four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (121), $\frac{1}{4}$-inch lockwashers (122), and $\frac{1}{4}$-inch flat washers (123).

(6) Position the O-ring gasket (146) in the groove on the top side of the choke body (149) flange. Mate the choke body (149) flange with the conductor housing (138). Orient the choke body (149) so that the threaded boss aligns with the IFF jack on the side of the conductor housing (138). Fasten the choke body (149) to the conductor housing (138) with six $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (151), twelve $\frac{1}{4}$-inch flat washers (150 and 145), and six $\frac{1}{4}$-inch by 20 self-locking hexagonal nuts (144).

(7) Fasten the lower IFF contact (141) to the threaded boss on the side of the choke body (149), using an 8 by 32 by $\frac{7}{8}$-inch fillister-head screw (143) and a No. 8 lockwasher (142).

(8) Push up the upper choke (134) which is attached to the IFF rf transmission line section outer conductor (39) until the ball bearing (132) seats in the recessed area on the bottom of the adapter (124).

(9) Place an O-ring gasket (137) in the groove on the top flange of the conductor housing (138). Carefully slide the choke assembly (147) over the IFF rf transmission line section (26), and rotate the conductor housing (138) so that the IFF jack mates conveniently with the IFF cable. Fasten the conductor housing (138) to the adapter (124); use six $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (140), twelve $\frac{1}{4}$-inch flat washers (139 and 130), and six $\frac{1}{4}$-inch by 20 self-locking hexagonal nuts (129).

(10) Place the spacer insulator (156) on the reference line section contact (155), and fit into the groove. Place the teflon sleeve (154) into the smaller opening end of the reference line section contact (155).

(11) From the top of the rotary joint, push the IFF rf transmission line section down

until the end of the inner conductor is flush with the bottom of the choke body (149). Slide the teflon sleeve (154) end of the reference line section contact over the reference rf transmission line section (25). The flange end of the teflon sleeve (154) should butt against the IFF rf transmission line section (26).

(12) Fit the O-ring gasket (153) over the connector adapter (157), and fasten to the bottom of the choke body (149) with three 10 by 24 by $\frac{5}{8}$-inch fillister-head screws (159) and No. 10 lockwashers (158). Fastening the connector adapter (157) to the choke body (149) should result in pushing the reference and IFF rf transmission line section (25 and 26) upward.

c. Installation Procedure of IFF Rf Transmission Line Adapter and Attaching Parts.

(1) Fit the O-ring gasket (40) into the groove around the outside and lower portion of the end sleeve (38).

(2) Place one of the rubber gaskets (37) on top of the upper-end flange of the IFF rf transmission line section outer conductor (39), and align the mating holes.

(3) Align the pin in the side of the end sleeve (38) with the mating groove inside the upper end of the main rf transmission line section (41). Mate and align the four holes in the end sleeve (38) with the four holes in the top flange on the IFF rf transmission line section outer conductor (39).

(4) Place a second rubber gasket (37) on top of the end sleeve (38). Slide the IFF rf transmission line adapter (29) over the IFF rf transmission line section (26). Orient the IFF rf transmission line adapter (29) so that the IFF jack is pointing toward the rf horn. Fasten the flange of the IFF rf transmission line adapter (29) to the top flange on the IFF rf transmission line section outer conductor (39); use four 8 by 32 by $\frac{3}{4}$-inch socket-head screws (34), No. 8 lockwashers (35), and No. 8 flat washers (36).

(5) Slide the round rubber section seal (28) over the reference and IFF rf transmission line sections (25 and 26) followed by the packing nut (27). Thread the packing nut (27) onto the IFF rf transmission line adapter (29) until it is handtight. Using an appropriate open-end wrench (not pliers), take 1 complete turn on the packing nut (27). Do not overtighten.

(6) Place the locking nut (24), O-ring gasket (160), internal tapered spacer (23), and slotted sleeve (22) over the reference and IFF transmission line sections (25 and 26) in the order mentioned. Orient the internal tapered spacer (23) so that the flat side is against the O-ring gasket (160) and the internal tapered side is against the slotted sleeve (22). Place the O-ring gasket (21) over the threaded portion of jack J807 (15). Place jack J807 (15) and attached angle adapter (12) over the ends of the reference and IFF transmission line sections (25 and 26). The end of the IFF rf transmission line section (26) should butt against the seat inside jack J807 (15). Orient the EIA type angle adapter (12) so that it points toward the center of the reflector and fasten jack J807 (15) to the IFF rf transmission line section using the O-ring gaskets (21 and 160), slotted sleeve (22), internal tapered spacer (23), and locking nut (24).

(7) Fasten the two line section guards (1 and 2) to the flange on top of the main rf transmission line section (41); use six $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch socket-head screws (8), $\frac{1}{4}$-inch lockwashers (9), and $\frac{1}{4}$-inch flat washers (10).

(8) Fasten the two line section guards (1 and 2) to each other with four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (7), eight $\frac{1}{4}$-inch flat washers (6 and 5), four $\frac{1}{4}$-inch lockwashers (4), and four $\frac{1}{4}$-inch by 20 hexagonal nuts (3).

2–7. Installation of Antenna AS–1748/FPS or AS–847/FPS

(fig. 9–3)

After the pedestal has been leveled and fastened securely, assemble the parts of Antenna AS–1748/FPS or AS–847/FPS to the rotor assembly. When necessary, use a crane or other suitable lifting device for lifting the reflector sections into position

while securing them. Proceed as outlined below.

a. Reflector Assembly. Assemble the parts of the reflector assembly onto the rotor assembly as follows:

(1) Lift reflector support E807 into position and bolt it to the rotor assembly. Use the four $1\frac{1}{4}$-inch-diameter by $3\frac{1}{2}$-inch-long bolts and lockwashers in the reflector support to secure it to the rotor assembly. Tighten these bolts securely.

(2) Place reflector center section E800 on the reflector support and secure it with the four 1-inch by 14 by $6\frac{1}{2}$-inch-long captive bolts (H808, H809, H810, and H811) and lockwashers on the reflector support.

(3) Lift No. 2 right-hand reflector section E804 into position at the right and side of reflector center section E800. Fasten the sections together with the nine coupling bolts in E804. Use the special $1\frac{3}{4}$-inch open-end wrenches to tighten the coupling bolts.

(4) Lift No. 2 left-hand reflector section E803 into position at the left side of reflector section E800. Fasten the sections together with the nine coupling bolts in E803.

(5) Attach No. 3 right-hand reflector section E801 to E804, and No. 3 left-hand reflector section E802 to E803. Tighten the coupling bolts securely.

(6) Attach No. 4 right-hand reflector section E805 to E801, and No. 4 left-hand reflector section E806 to E802. Tighten the coupling bolts securely.

b. Horn-Support Assembly. The following procedure involves the fastening together of waveguide flanges with waveguide pressure windows and gaskets between flanges. The two types of flange and window mating surfaces that will be encountered are a grooved type and a flat type. Install the appropriate style of gasket to fit the individual combination of mating flange. Wipe off both sides of all waveguide gaskets to remove silicone grease and any foreign particles that may have come in contact with the grease. Inspect the gaskets and discard any that show deformed areas in the rubber portions. Before installing waveguide flanges, apply a thin coat of silicone grease (MIL–I–8660 amend. 1) to both sides of the rubber portion of the gasket. Do not coat the metal surface of the gasket with silicone grease. Silicone grease tends to prevent the rubber portion of the gasket from drying out and aids in obtaining a pressure-tight seal. Wipe all waveguide and waveguide window mating flanges clean of silicone grease and foreign particles before securing together. The types of gaskets used between standard waveguide flanges are given in the chart below.

Item	Raytheon part No.	Used
Gasket	287–1254P1	Between smooth flange and grooved flange.
Special gasket	4446–1050P1	Between smooth flange and grooved flange.

(1) Lift the horn-support assembly into position, insert the four dowel pins in the mating holes in the reflector support, and fasten with the four $\frac{3}{4}$-inch by 10 captive screws in the reflector support (H804, H805, H806, and H807).

(2) Remove the protective cover from the free end of waveguide twist W801 on the horn-support assembly.

Note. The waveguide twist on Antenna Group OA–4040/FPS–69 is the flexible type; on Antenna Group OA–6957/FPS–71, it is the rigid type.

(3) Fasten waveguide twist W801 to the dome assembly (upper waveguide transition) by performing the following procedure:

(*a*) *Antenna Group OA–4040/FPS–69.* Fasten waveguide twist W801 to the upper waveguide transitions (fig. 2–5); use two waveguide gaskets, a waveguide window and pressure regulator, ten $\frac{5}{16}$-inch by 18 by $2\frac{3}{4}$-inch socket-head screws, ten $\frac{5}{16}$-inch lockwashers, and ten $\frac{5}{16}$-inch flat washers, as shown in A, figure 2–5. Orient the waveguide window and pressure regulator as instructed by the stenciling on the part. When installed, the regulator portion attached to the waveguide window is on the bottom.

(*b*) *Antenna Group OA–6957/FPS–71.* Fasten waveguide twist W801 to the dome assembly as follows (fig. 2–6):

1. Fasten the short waveguide section to the dome assembly (waveguide transi-

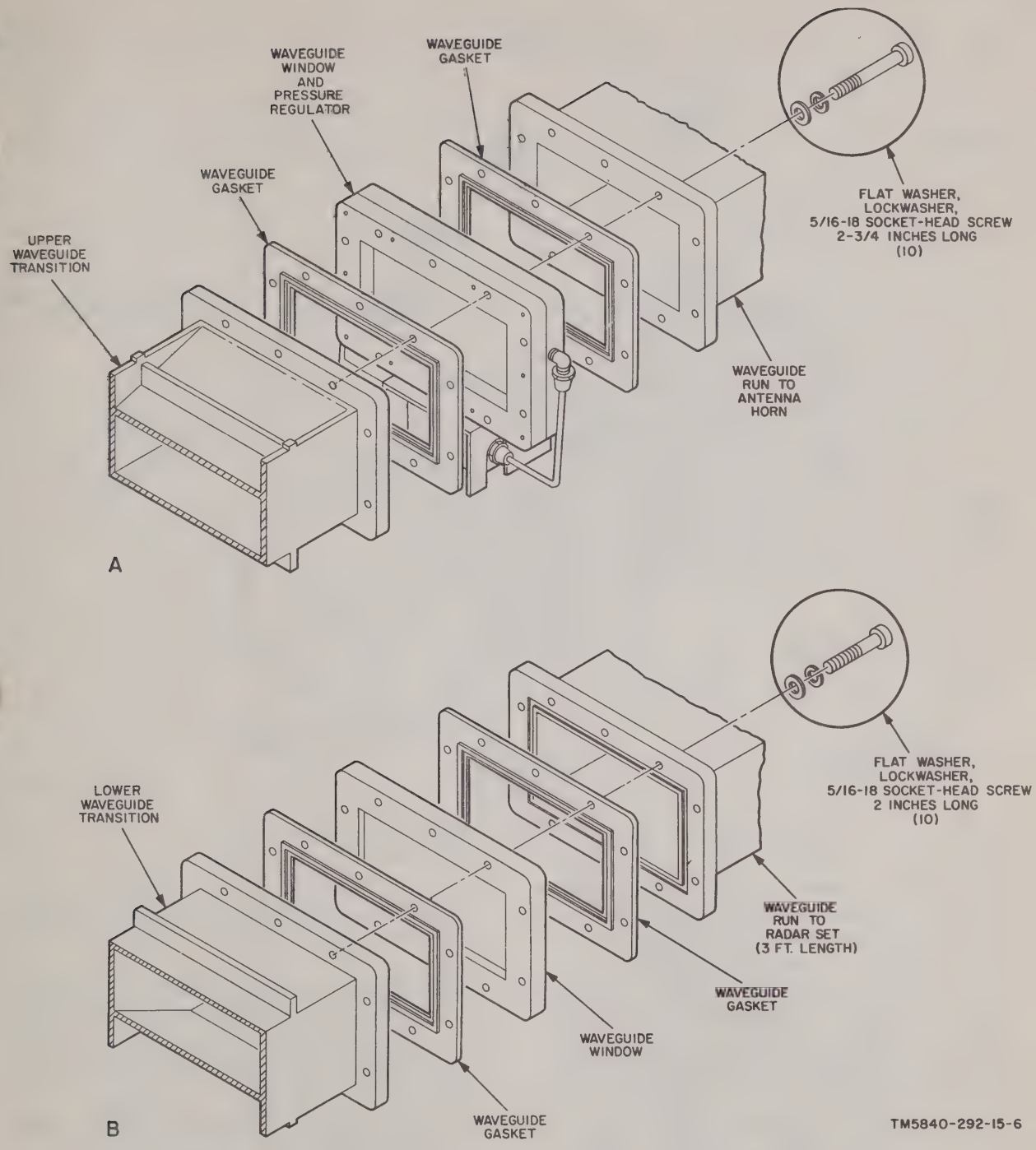


Figure 2–5. Antenna Group OA–4040/FPS–69 waveguide window and pressure regulator.

tion); use a special waveguide gasket, ten $\frac{5}{16}$-inch by 18 by 1-inch socket-head screws, ten $\frac{5}{16}$-inch lockwashers and ten $\frac{5}{16}$-inch flat washers. Orient the special waveguide gasket so that the thick portion of the rubber gasket is against the grooved flange of the short waveguide section, and the nar-

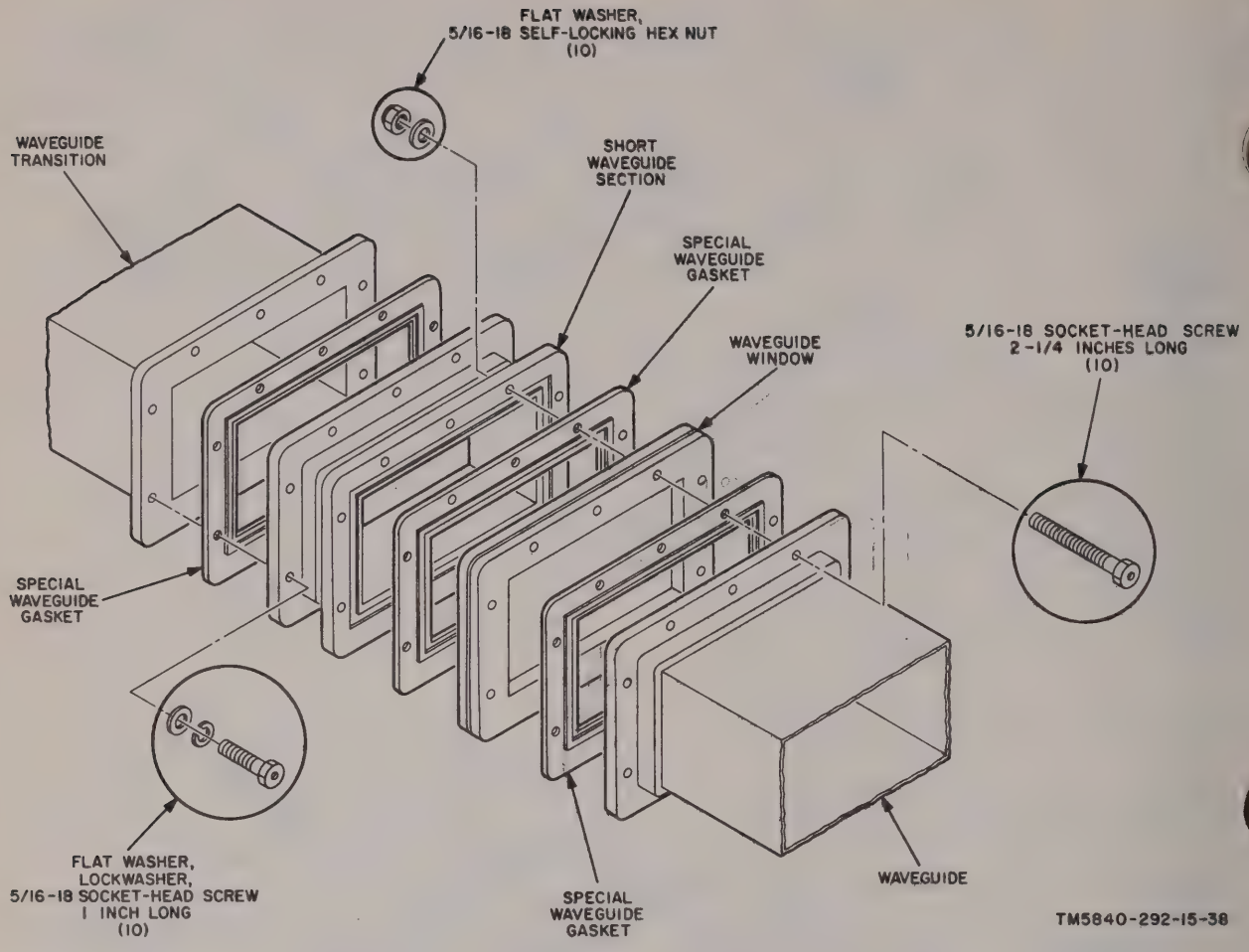


Figure 2-6. Antenna Group OA-6957/FPS-71 waveguide window.

row portion of the rubber gasket is against the smooth flange of the dome assembly (waveguide transition).

2. Fasten waveguide twist W801 to the short waveguide section; use two special waveguide gaskets, one waveguide window, ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screws, ten $\frac{5}{16}$-inch flat washers, and ten $\frac{5}{16}$-inch by 18 self-locking hexagonal nuts. Orient the special gaskets so that the thick portion of the rubber gasket is against the grooved flanges of the waveguide twist and the short waveguide section, and the narrow portion of the rubber gasket is against the smooth flange of the waveguide window. Orient the waveguide window so that the pressure side is toward the dome assembly (waveguide transition).

(4) Fasten the adapter (CP1002, $\frac{7}{8}$ EIA-HN) to jack J803 with three $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head screws, $\frac{1}{4}$-inch lockwashers, $\frac{1}{4}$-inch by 20 hexagonal nuts, and one O-ring gasket.

(5) Connect Radio Frequency Cable Assembly CG-1514/U (11 ft) (Cable W854), attached to the horn support, between adapter CP1002 (on the top of the rotor assembly) and J804 (just below the antenna horn cover).

c. Horn-Positioning Check. Use the measuring rod assembly to check for the correct location of the

antenna horn with respect to the reflector, as follows:

(1) Adjust measuring rod assembly E809 to the minimum length and secure the telescoping sections together with the captive taper pin.

(2) Place the measuring rod assembly between one of the measuring rod sockets below the antenna horn cover (fig. 2–7) and the spherical socket in the lower edge measuring screw on the center reflector section (fig. 2–7). If the measuring rod assembly will fit and set firmly between these two sockets, the dimensions are within the ½-inch allowable tolerance.

(3) Place the measuring rod assembly between the other measuring rod socket below the antenna horn cover and the same measuring socket on the reflector. If the measuring rod assembly will fit and set firmly between these two sockets, the dimensions are within ½-inch allowable tolerance.

(4) Adjust the measuring rod assembly to the next longer length and secure the telescoping sections together with the captive taper pin.

(5) Place the measuring rod assembly between each of the two measuring rod sockets above the antenna horn cover and the measuring rod socket on the top edge of the center reflector section. A fit at these positions indicates that these dimensions are within the allowable tolerance.

(6) Adjust the measuring rod assembly to the maximum length and pin the sections together.

(7) Place the measuring rod assembly between the left-hand measuring rod socket below the antenna horn cover and the socket in the measuring screw on left-hand reflector section No. 2. Place the measuring rod assembly between the bottom right-hand socket on the antenna horn and the measuring screw on right-hand reflector section No. 2.

(8) If the measuring rod assembly does not seat properly in the positions described above, the relative position of the antenna horn and the reflector is not within the required tolerance. Remove and replace the horn until the position of the antenna horn and reflector is within the required tolerance.

d. Waveguide Connection. The flange for connecting a run of waveguide from the antenna to the parent radar set is located inside the opening for the waveguide (fig. 2–4), just to the left of the dry-air cylinder mounting facility. A 3-foot length of waveguide connected to the waveguide window assembly (fig. 2–5 or 2–6) provides means for connecting the external waveguide run to the parent radar set. When necessary or convenient, the waveguide coupling flange can be moved to the opposite side of the pedestal by removal and remounting of the 3-foot section of waveguide. Connections to the 3-foot section of waveguide could be a 10-foot waveguide section where a low antenna foundation is provided, or an E-bend to go straight down where a tower is used to support the antenna. To reposition the waveguide coupling flange to the opposite side of the pedestal, perform the following procedure:

(1) Disconnect the flexible dry-air hose (273, fig. 8–16) from the fitting in the adapter (78, fig. 9–10; or 124, fig. 9–9) and detach the hose.

(2) Carefully swing the lower waveguide transition (77, fig. 8–4; or 102, fig. 9–9) around 180°.

(3) If the waveguide coupling flange has been rotated, cover A852 and shield A889 (15 and 58, fig. 8–2) must be removed and interchanged. Remove the hardware that holds both cover A852 and shield A889 to the side skins. Refasten cover A852 to the unused waveguide access opening in the side skin, using the original hardware. If the waveguide coupling flange has not been rotated, remove the hardware that holds only shield A889 to the side skin.

(4) To connect the 3-foot section of waveguide to the lower waveguide transition on Antenna Pedestal AB–651/FPS–69, refer to B, figure 2–5 and perform the following procedure:

(*a*) Fasten the 3-foot section of waveguide to the lower waveguide transition, using two waveguide gaskets, one waveguide

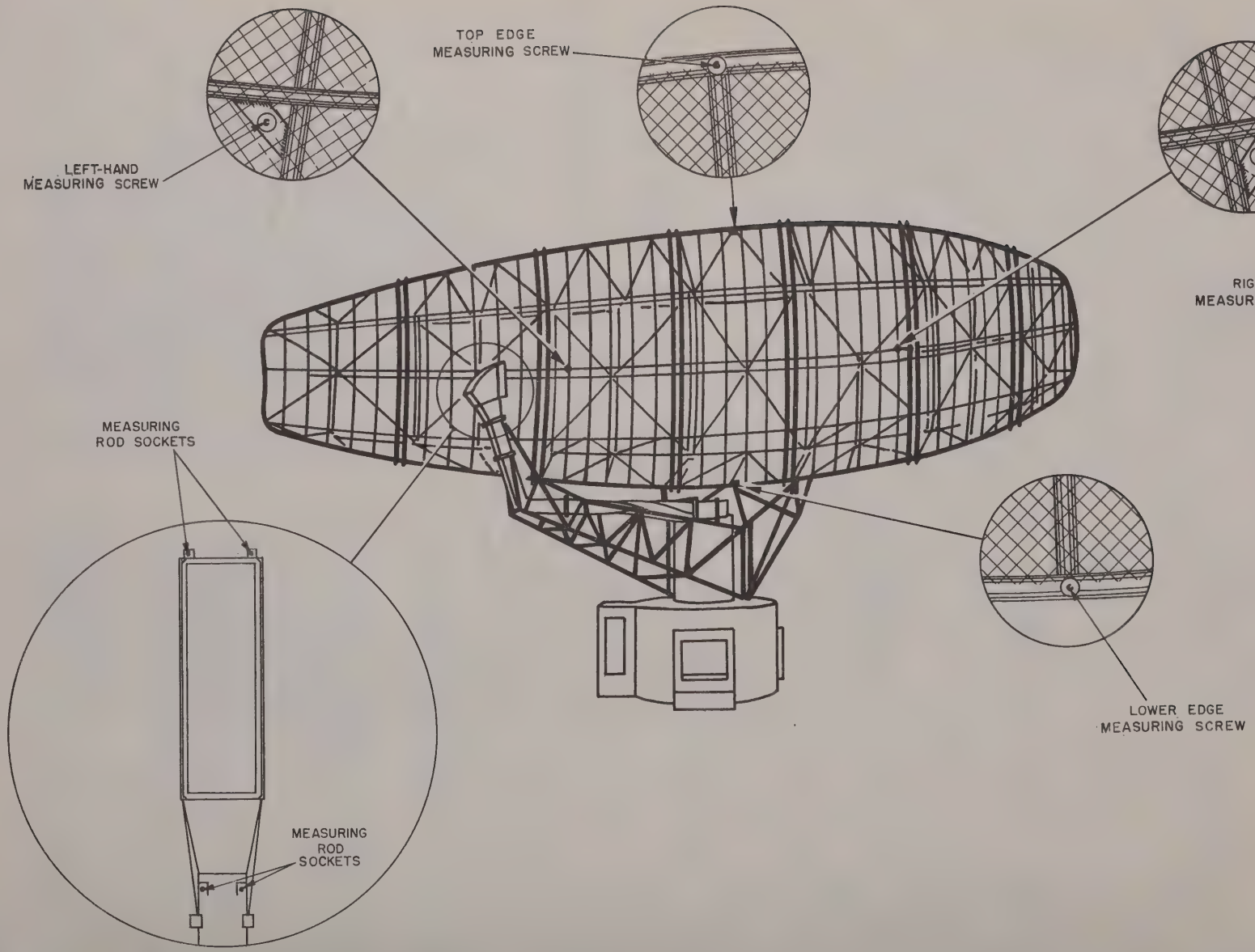


Figure 2–7. Horn-positioning check.

window, ten $\frac{5}{16}$-inch by 18 by 2-inch-long socket-head screws, ten $\frac{5}{16}$-inch lockwashers, and ten $\frac{5}{16}$-inch flat washers. Orient the waveguide window so that the pressure side is toward the lower waveguide transition.

(*b*) Fasten shield A889 to the side skin, using the original hardware.

(5) To connect the 3-foot section of waveguide to the lower waveguide transition on Antenna Pedestal AB–876/FPS–71, refer to figure 2–6 and perform the following procedure:

(*a*) Fasten the short waveguide section to the lower waveguide transition, using a special waveguide gasket, ten $\frac{5}{16}$-inch by 18 by 1-inch socket-head screws, ten $\frac{5}{16}$-inch lockwashers, and ten $\frac{5}{16}$-inch flat washers. Orient the special waveguide gasket so that the thick portion of the rubber gasket goes against the grooved flange of the short waveguide section, and the narrow portion of the rubber gasket goes against the smooth flange of the lower waveguide transition.

(*b*) Fasten the 3-foot section of waveguide to the short waveguide section, using two special waveguide gaskets, one waveguide window, ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screw, ten $\frac{5}{16}$-inch flat washers, and ten $\frac{5}{16}$-inch by 18 self-locking hexagonal nuts. Orient the special gaskets so that the thick portion of the rubber gasket is against the grooved flanges of the 3-foot section of waveguide and the short waveguide section, and the narrow portion of the rubber gasket is against the smooth flange of the waveguide window. Orient the waveguide window so that the pressure side is toward the waveguide transition.

(*c*) Fasten shield A889 to the side skin, using the original hardware.

(6) If the flexible dry-air hose (273, fig. 8–16) was removed for rotating the lower waveguide transition, reconnect the hose to the pipe-to-tube fitting on the side of the adapter (78, fig. 9–10; or 124, fig. 9–9).

e. Initial Filling of Oil. Thirty gallons of Lubricating Oil, Gear, MIL–L–6086 packed in six 5-gallon containers, is furnished.

(1) Remove the filler cap and, using the funnel provided, pour 20 gallons of oil MIL–L–6086 into the lubricating oil sump (figs. 5–2 and 7–4).

(2) Remove the filler plug (fig. 5–3) and fill the speed reducer with oil, up to the middle of the oil level sight glass (approximately $5\frac{1}{4}$ gals).

(3) Remove the vent cap and the fill level plug (fig. 5–2), and fill the lubrication pump gear head with oil so that the oil runs out of the fill level plug hole (approximately $3\frac{3}{4}$ pints).

(4) Return the filler cap, the filler plug, vent cap, and fill level plug to their respective locations.

f. Sealing Antenna Pedestal. To prevent water from seeping into the antenna pedestal, the seam between the two half-cover sections on top of the pedestal (fig. 8–2) must be sealed. Use the caulking gun and cartridges provided, and proceed as follows:

(1) Insert the end cap (plunger) of the caulking gun in the open end of the loaded cardboard cartridge.

(2) Place the cartridge in the caulking gun and engage the trigger mechanism.

(3) Fill the seam located between the two pedestal half-cover sections; use the loaded caulking gun. Use a sufficient amount of compound to prevent water seepage.

2–8. Installation of Antenna AS–1308/FPS

(figs. 2–8 and 2–9)

The reference antenna and its pedestal support are fastened to the supporting structure of center section E800 (fig. 9–3) of the main antenna reflector. To install the reference antenna and the reference antenna pedestal support, follow the step-by-step procedure given below.

a. Install and fasten the angle bracket and clamp for cable W60 to the reference antenna pedestal support as shown in figure 2–8.

(1) Fasten the angle bracket to the channels of the reference antenna pedestal support, using two $\frac{3}{8}$-inch by 16 by $\frac{3}{4}$-inch capscrews, $\frac{3}{8}$-inch flat washers, $\frac{3}{8}$-inch lockwashers, and $\frac{3}{8}$-inch by 16 hexagonal nuts.

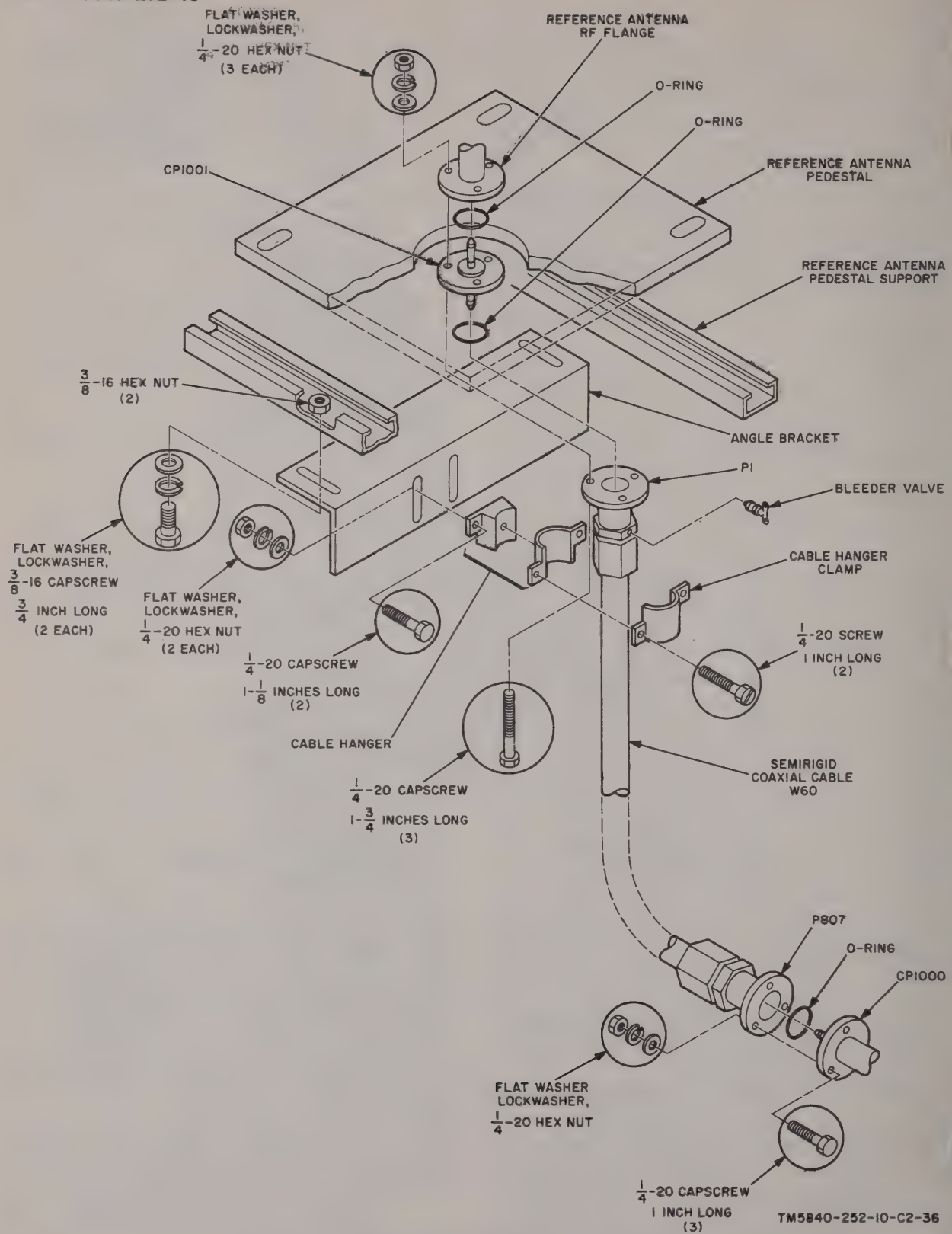


Figure 2-8. Reference antenna cable support, installation details.

When installed, the vertical side of the angle bracket is toward the rigid brace of the reference antenna pedestal support shown in figure 2–9.

(2) Fasten the cable hanger to the angle bracket, using two $\frac{1}{4}$-inch by 20 by $1\frac{1}{8}$-inch capscrews, $\frac{1}{4}$-inch flat washers, $\frac{1}{4}$-inch lockwashers, and $\frac{1}{4}$-inch by 20 hexagonal nuts.

b. Install and fasten the reference antenna pedestal support to the center section of the supporting structure of the main antenna reflector as shown in figure 2–9.

(1) Orient the reference antenna pedestal support so that the fixed brace is toward the radiating horn and the movable brace is away from the radiating horn. Fasten the fixed brace to the horizontal structure in the center of the main antenna reflector approximately $3\frac{1}{2}$ feet down from the top, and directly behind the reflector; use the half-round clamps and the $\frac{3}{8}$-inch by 16 $1\frac{1}{16}$-inch capscrews, $\frac{3}{8}$-inch flat washers, $\frac{3}{8}$-inch lockwashers, and $\frac{3}{8}$-inch by 16 hexagonal nuts.

(2) Fasten the movable brace of the reference antenna pedestal support to the top rear structure of the 40-foot reflector, using the half-round clamps and the $\frac{3}{8}$-inch by 16 by 2-inch capscrews, $\frac{3}{8}$-inch flat washers, $\frac{3}{8}$-inch lockwashers, and $\frac{3}{8}$-inch by 16 hexagonal nuts.

(3) Loosen the eight turnbuckle checknuts. Place a level on the top of the reference antenna pedestal support and adjust the turnbuckles until the top of the antenna support is level in both planes. Tighten the eight turnbuckle checknuts and recheck to insure that the top of the antenna support is still level.

c. Install and fasten the reference antenna to the reference antenna pedestal support as shown in figure 2–9.

(1) Loosen and remove the four $\frac{1}{2}$-inch by 13 by $1\frac{1}{2}$-inch capscrews, $\frac{1}{2}$-inch flat washers, and $\frac{1}{2}$-inch lockwashers from the special nut (spring loaded) in the top channel of the reference antenna pedestal support. Retain the hardware.

(2) When lifting the reference antenna into place, use adequate manpower—three men on top of the reflector for lifting, and one man down below for guiding purposes. Tie a rope securely to the reference antenna in such a manner that it does not interfere with fastening the reference antenna pedestal to the pedestal support. Besides the lifting rope, attach a second line to the reference antenna pedestal for guiding purposes to hold the reference antenna away from the reflector while it is being lifted.

(3) Pull the reference antenna up via the front of the main antenna reflector while the man down below guides it. Lift the reference antenna over the top of the main antenna reflector and position it on the reference antenna pedestal support. Identify the front of the reference antenna by noting the V formed by the screws on the bottom of it. The opening of the V must point toward the main antenna feed horn.

(4) Fasten the reference antenna to the reference antenna pedestal support with the four $\frac{1}{2}$-inch by 13 by $1\frac{1}{2}$-inch capscrews, $\frac{1}{2}$-inch flat washers, $\frac{1}{2}$-inch lockwashers, and the special nuts (attached to the channels of the reference antenna pedestal support). It may be necessary to slide the special nuts in the channels of the reference antenna pedestal support to align with the fastening hardware.

2–9. Interconnections

a. General Cabling Instructions. Electrical power cable assembly W80 is furnished with this equipment for connection to a 120/208-volt, 3-phase, four-wire supply source. The length of power input cable W80 will vary between installations and will be determined by the tower height. Radiofrequency cable assembly W60 (17 ft, 10 in.) is furnished with this equipment for connecting the reference antenna to the top of the rotary joint. This cable is semirigid and is fitted with EIA connectors at each end. Cables for connecting the synchro, resolver, and control circuits of the antenna pedestal to those of the parent radar set are not supplied with this equipment, but are furnished as part of the parent radar set. The synchro and control cable supplied with the parent radar set is specifically designed for use with

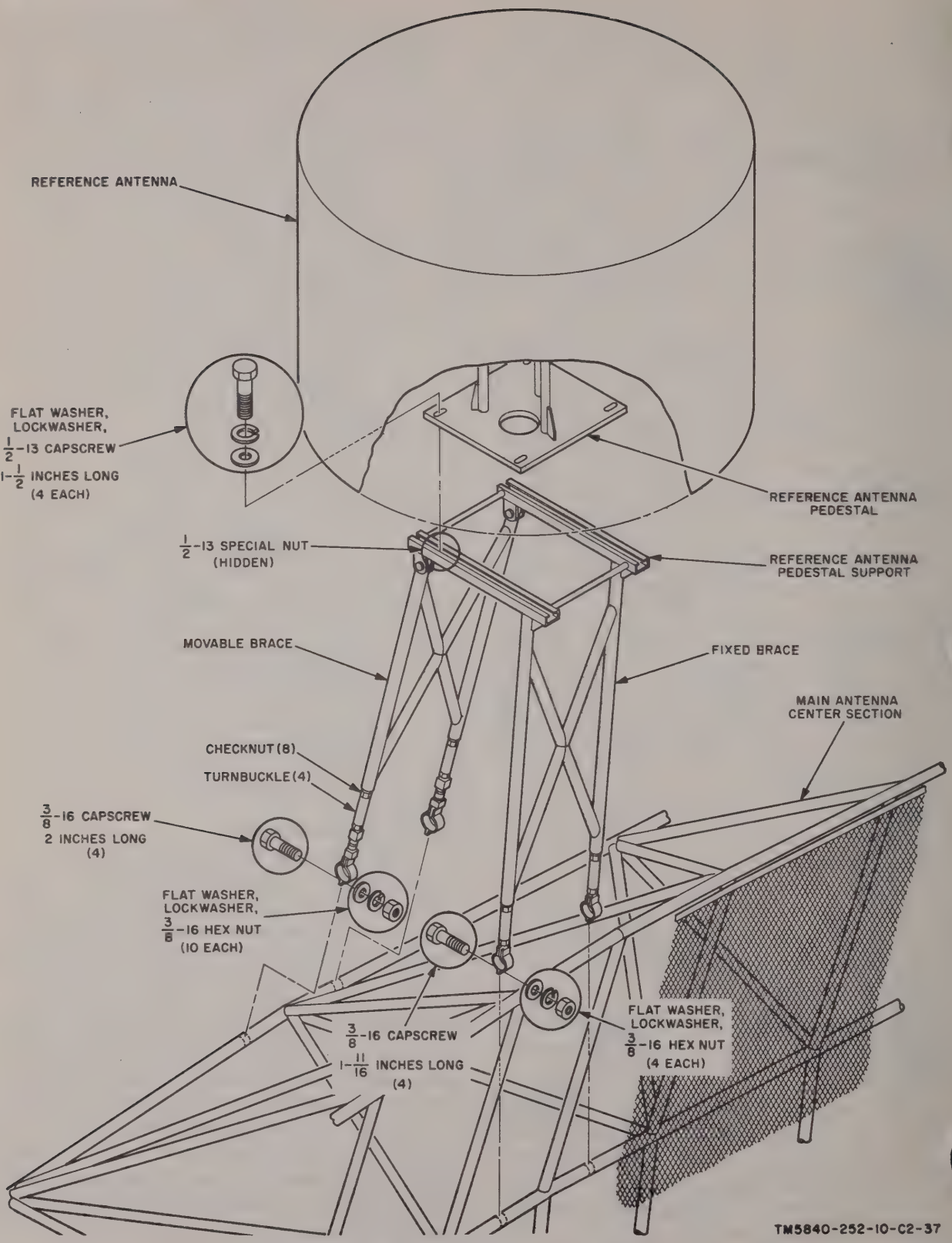


Figure 2-9. Reference antenna, installation details.

the antenna group. It includes a stuffing tube assembly on one end for attachment of the cable to the distribution box on the pedestal, and a connector plug on the other end for connection to the parent radar set. This cable length also will vary between installations; the length will be determined by the tower height. Observe the following general instructions when installing cables:

(1) Avoid sharp bends.
(2) Do not splice the cable. Either requisition sufficient cable length through supply channels or, if splicing is necessary, use a junction box (weathertight if exposed to the elements).
(3) Avoid running the cables across a floor or on the ground; if unavoidable, protect them with pipes, conduits, or other effective means.
(4) Secure all cables to relieve strain from the connectors or stuffing tube assembly.
(5) Keep the cables away from steam or hot water pipes.
(6) Protect the cables from contact with oils and greases.
(7) Protect the cables at all points where subject to abrasion or other damage.

b. Installing Power Cable. Install electrical power cable assembly W80 between the distribution box and the fused line switch (not furnished) at the power source.

(1) Assemble the stuffing tube assembly to the distribution box, using the 2-inch-diameter cutout at the left-hand side of the bottom edge of the distribution box. Assemble with the washer and locknut inside the distribution box. Tighten the locknut securely.
(2) In the distribution box on antenna pedestal serial numbers 1 through 109 that have not been modified by MWO 11–5840–243–30/1, and in the distribution box on antenna pedestal serial numbers 110 and up, connect the white, red, and green conductors to terminals L1, L2, and L3 (respectively) of motor contactor K801. Connect the black conductor to the ground terminal, just below K801 (fig. 2–10).
(3) In the distribution box on antenna pedestal serial numbers 1 through 109, after modification by MWO 11–5840–243–30/1, connect the white, red, and green conductors to terminals L1, L2, and L3 (respectively) of the terminal block assembly (fig. 2–11).

c. Installing Synchro and Control Cable. Install synchro and control cable W81, when available, between the distribution box and the parent radar set by the following procedure and the instructions in the parent radar set manual.

(1) Assemble the stuffing tube assembly of cable W81 to the distribution box with the $1\frac{3}{4}$-inch-diameter cutout at the right side of the bottom edge.
(2) Connect the 18 active conductors to the corresponding terminals on terminal boards TB804, TB803, and TB801 (fig. 2–12). The ends of the conductors are tagged. The tag designation corresponds with the terminal numbers to which the conductors are to be attached.
(3) At the radar set, connect the other end of W81 as instructed in the parent radar set manual.

d. Synchro and Control Cable Fabrication Procedure. When the antenna group is mounted on a tower and the existing synchro and control cable is not long enough, a new cable of sufficient length must be fabricated and installed. The makeup of the parent radar set end of the cable will be covered in the parent radar set manual. Use grade 1, class C, type 211055 cable or other suitable cable. Fabricate and connect this cable as follows:

(1) Strip off the outer sheath for a length of 22 inches.
(2) Slide the gland nut, gland ring, packing, and stuffing tube on the cable; position the cable so that the end of the cutoff sheath is just barely visible at the threaded end of the stuffing tube. Use a size K, 45° stuffing tube, type 54 BuShips No. 9–S–5355L ALT 9.
(3) Assemble the stuffing tube, packing, gland ring, and gland nut.
(4) Form the leads as shown in figure 2–13; lace the wires neatly and securely, as shown and instructed in paragraph 258 in TM 11–4000. Fold back the unused leads and tie them to the harness.
(5) Install the cable as outlined in *c* above.

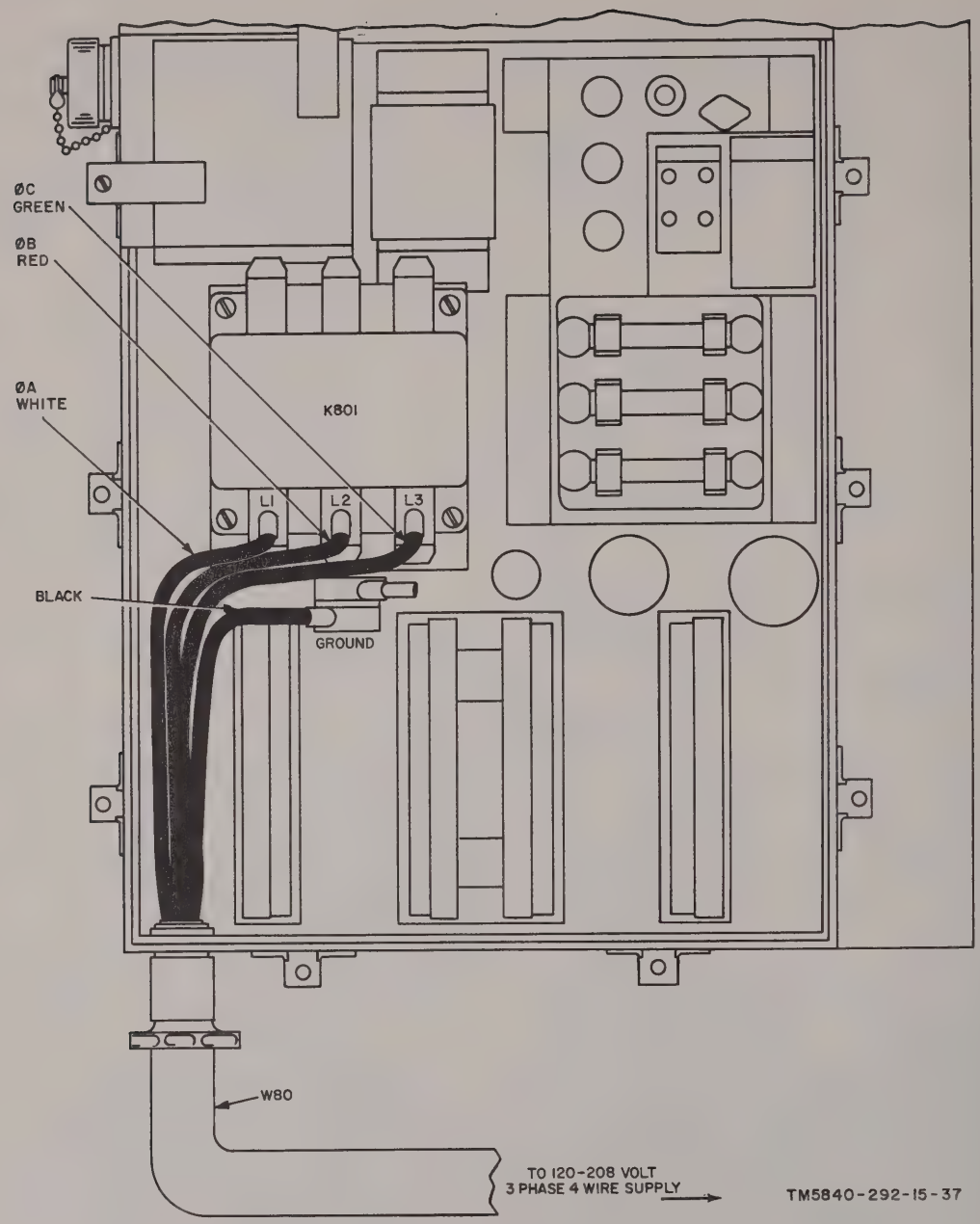


Figure 2–10. Power input cable connections in distribution box.

(6) Refer to the parent radar set manual for the functional termination of the cable conductors.

e. Installing Reference Antenna Coaxial Cable. Reference antenna cable W60 is semirigid and runs from the reference antenna to the top of the rotary joint on the antenna pedestal as shown in figure 2–8.

(1) Loosen and remove the two $\frac{1}{4}$-inch by 20 screws that hold the cable hanger clamp to the cable hanger, as shown in figure 2–8.

(2) Loosen (but do not remove) the two $\frac{1}{4}$-inch by 20 by $1\frac{3}{8}$-inch capscrews that fasten the cable hanger to the angle bracket, and the two $\frac{3}{8}$-inch by 16 by $\frac{3}{4}$-inch capscrews that

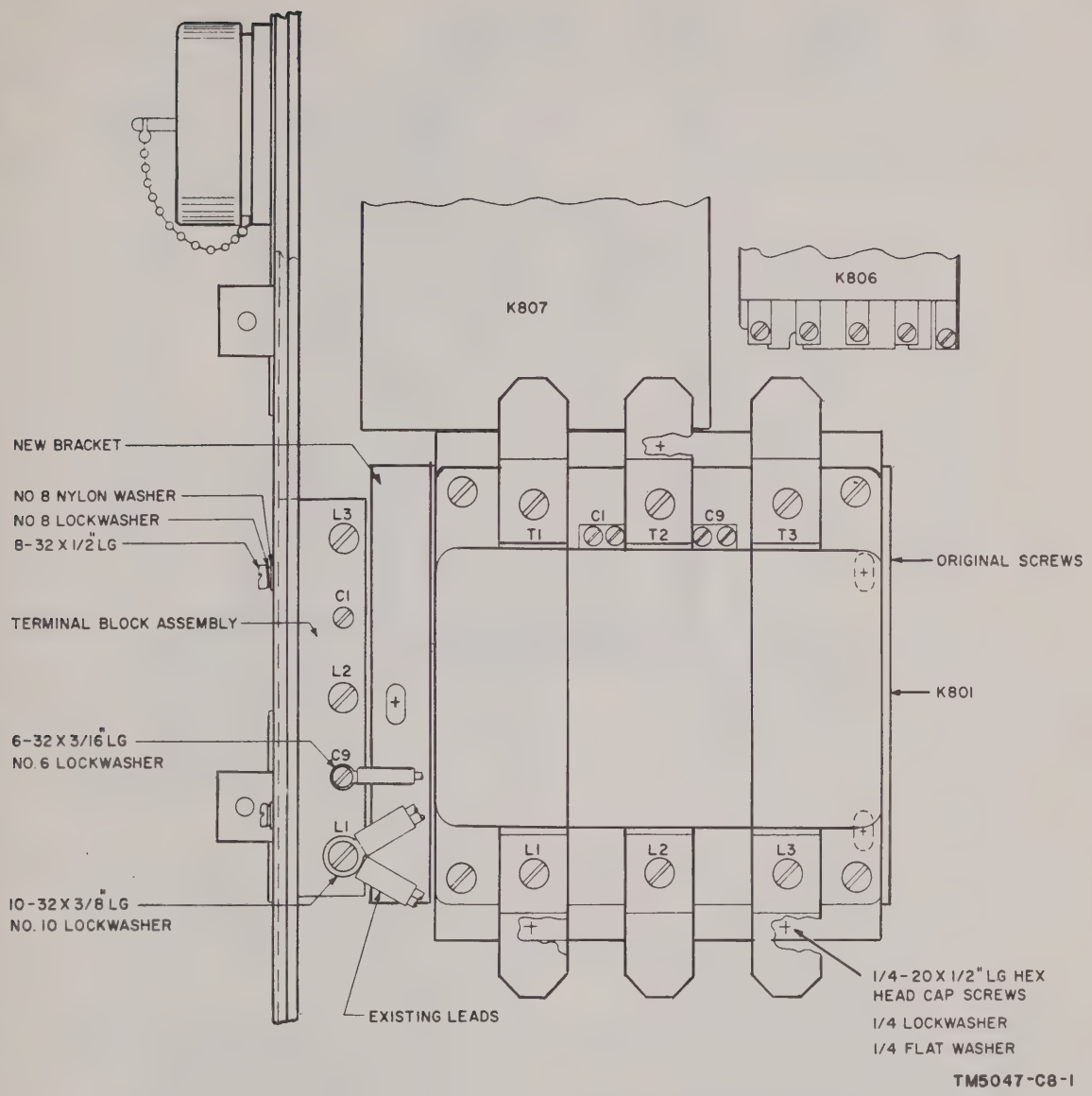


Figure 2–11. Relay K801 and power input terminal block assembly in distribution box (serial numbers 1 through 109) after modification by MWO 11-5840-243-30/1.

fasten the angle bracket to the reference antenna pedestal support, as shown in figure 2–8.

(3) Secure a line around cable W60 (approximately 3 ft from the P1 end) and, using the rope, hoist cable W60 up between the struts of the antenna reflector, as shown in figure 2–14. While supporting the cable in place, fasten P1 of cable W60 to J1 on the reference antenna via gas barrier adapter CP1001, as shown in figure 2–8. Place an O-ring gasket between adapter CP1001 and J1, and an O-ring gasket between CP1001 and P1. Fasten P1 to J1 via CP1001, using three $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch capscrews, $\frac{1}{4}$-inch flat washers, $\frac{1}{4}$-inch lockwashers, and $\frac{1}{4}$-inch by 20 hexagonal nuts.

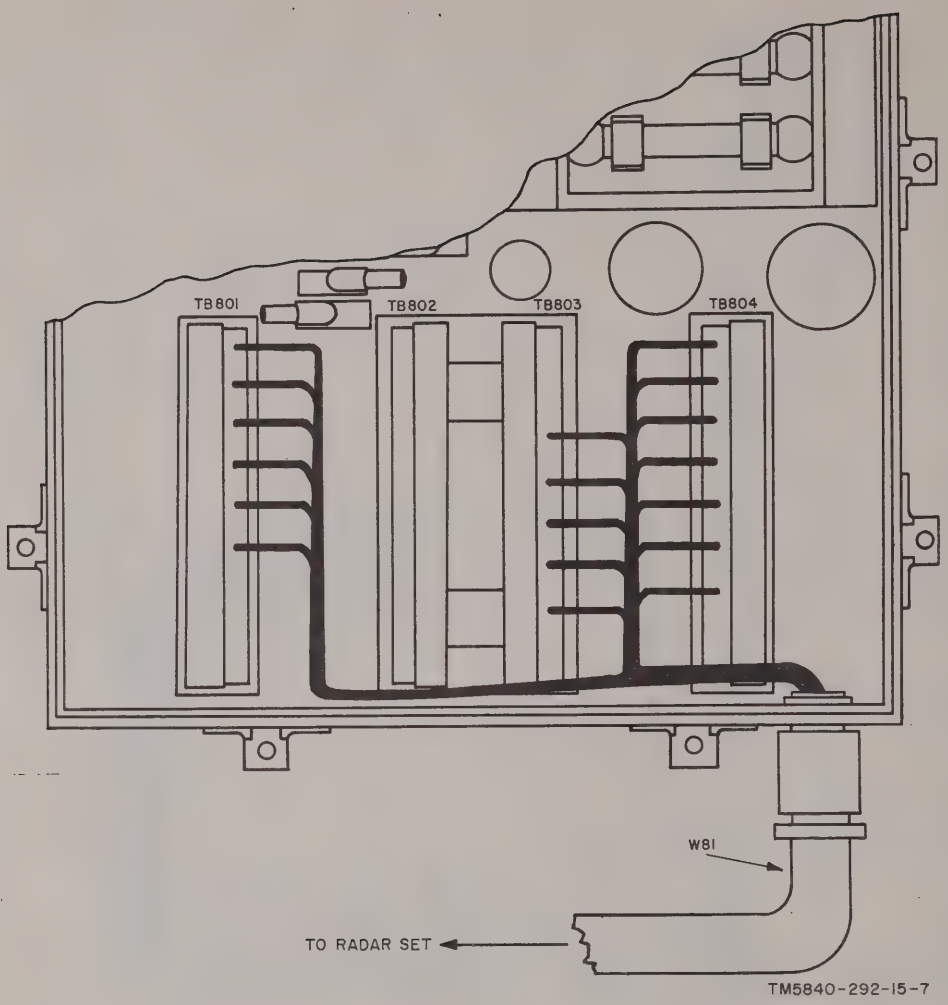


Figure 2–12. Synchro and control cable (W81) connections in distribution box.

(4) Fasten cable W60 to the cable hanger as follows:

(*a*) Temporarily assemble the cable hanger clamp to the cable hanger, using two $\frac{1}{4}$-inch by 20 screws (removed in (1) above); do not tighten.

(*b*) Center the cable hanger midway (vertical plane) in the elongated mounting holes. Tighten the fastening hardware that holds the cable hanger to the angle bracket.

(*c*) Alternately tighten, in small increments, the two $\frac{3}{8}$-inch by 16 by $\frac{3}{4}$-inch capscrews that hold the angle bracket to the reference antenna pedestal support, and the two screws that hold the cable hanger clamp to the cable hanger.

(*d*) Recheck all hardware and tighten, if necessary.

(5) Shape cable W60 for a slow sweep down the back and under the bottom of the antenna reflector. Connect P807 of W60 to angle adapter CP1000, as shown in figures 2–8 and 2–14.

Caution: **Cable W60 must be placed approximately 3 inches to one side of the centerline at the bottom of the main antenna reflector so that the cable will clear the identification plate mounted on the antenna reflector. Failure to ob-**

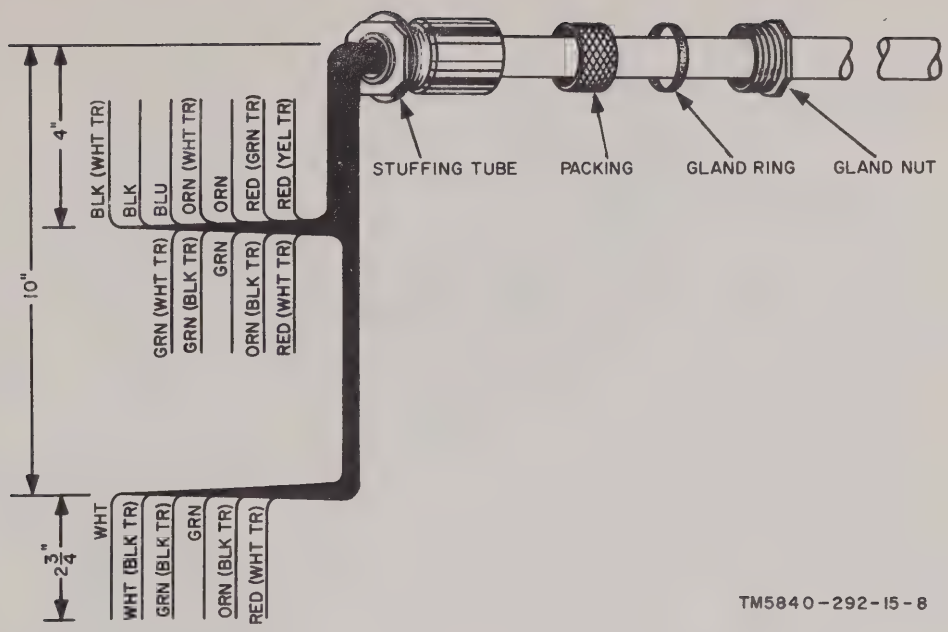


Figure 2–13. Synchro data and control cable.

serve this caution may result in chaffing the cable against the identification plate.

(6) Fasten P807 to CP1000, with an O-ring gasket between the two flanges; use three ¼-inch by 20 by 1-inch capscrews, ¼-inch flat washers, ¼-inch lockwashers, and ¼-inch by 20 hexagonal nuts.

(7) Fasten cable W60 to the main antenna reflector supports as follows (fig. 2–14):

(*a*) Using sheet metal shears, cut a 22-inch-long piece of metal banding material from the banding kit. Cut the banding material at right angles to the 22-inch length. Failure to use sheet metal shears, or cutting the banding material at a right angle, will result in difficulty while performing the following procedure:

(*b*) Pass one end of the metal band through the yoke (supplied in the banding kit), bend it back about 1½ inches, and flatten it down as shown in A, figure 2–14.

(*c*) Pass the band around the supporting structure member of the main antenna reflector and cable W60, and through the yoke, as shown in B, figure 2–14.

(*d*) Pass the band around the structure member and cable, and through the yoke a second time. Use pliers to pull the exposed end of the band tight. Fold back the exposed end of the banding material over the yoke to prevent it from loosening, as shown in C, figure 2–14.

(*e*) Insert the free end of the band into the slot in the banding tool (supplied with the banding kit), and set the ratchet level on the banding tool as shown in D, figure 2–14.

(*f*) Tighten the band, as shown in E, figure 2–14, by turning the banding tool in the direction shown until the cable is adequately secured to the support structure. Do not overtighten beyond the point of adequate support.

(*g*) Remove the banding tool from the rolled banding material by sliding it out through the end of the roll. The finished clamp should appear as shown in F, figure 2–14.

(*h*) Fasten cable W60 to the main antenna reflector supporting structure in at least four places.

f. Reference Antenna Coaxial Cable Fabrication. The following fabrication instructions for cable W60 can be used for repair of the existing cable or for

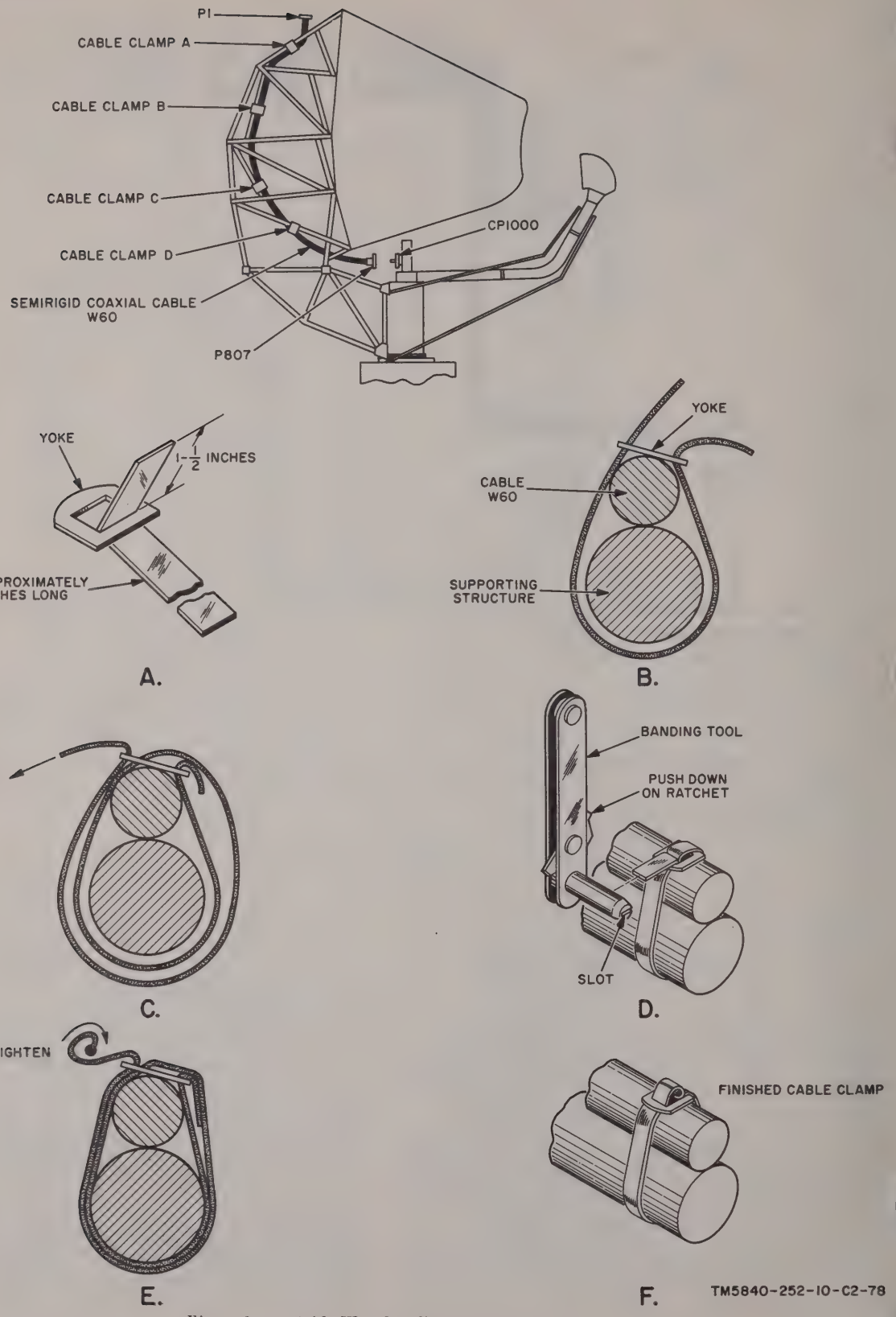


Figure 2-14. Cable W60, banding to antenna reflector.

making a new cable. Use a high-power, semirigid, aluminum-sheathed, $\frac{7}{8}$-inch-diameter, polyethylene jacket coaxial cable, Prodelin Inc, Cat. No. 64–875, or equivalent.

Note. This style of cable is used primarily because it has low attenuation at high frequencies and is capable of being pressurized.

(1) Using the dimension table in figure 2–15, measure back the distance X (for a $\frac{7}{8}$-inch cable size) from the end of the aluminum conductor (A, fig. 2–15) and cut halfway through the polyethylene jacket, using the appropriate tubing cutter (part of the parent radar set special tools). When using the tubing cutter, be extremely careful not to distort the shape of the outer aluminum conductor. Increase the pressure on the cutting wheel of the tubing cutter in small increments while rotating the entire tool about the cable.

Caution: **Excessive pressure on the cutting wheel without rotating the entire tool about the cable may cause the rollers to distort the outer aluminum conductor, thus preventing installation of the connector or preventing a good seal between the outer conductor and the connector.**

(2) Cut the polyethylene jacket lengthwise by inserting the point of the razor knife (part of the parent radar set special tools) between the jacket and the outer aluminum conductor. The flat portion of the knife should be against the aluminum conductor to prevent digs or scratches. Cut the polyethylene jacket lengthwise to the circumference cut made in (1) above.

(3) Lift the polyethylene jacket to produce a strain at the junction of the lengthwise cut and the partial circumferential cut. While peeling back the jacket, cut along the circumferential groove (cut in (1) above), being careful not to cut the outer aluminum jacket. Alternately cut and peel the polyethylene jacket until it is completely removed.

(4) Referring to the table in figure 2–15, measure back the distance Y (for a $\frac{7}{8}$-inch cable size) from the end of the aluminum conductor (B, fig. 2–15). Slowly cut through the aluminum conductor with the tubing cutter.

(5) Using the razor knife, cut through the dielectric flush with the end of the aluminum conductor (B, fig. 2–15). Remove the aluminum conductor and the dielectric, thus exposing the center copper conductor (C, fig. 2–15).

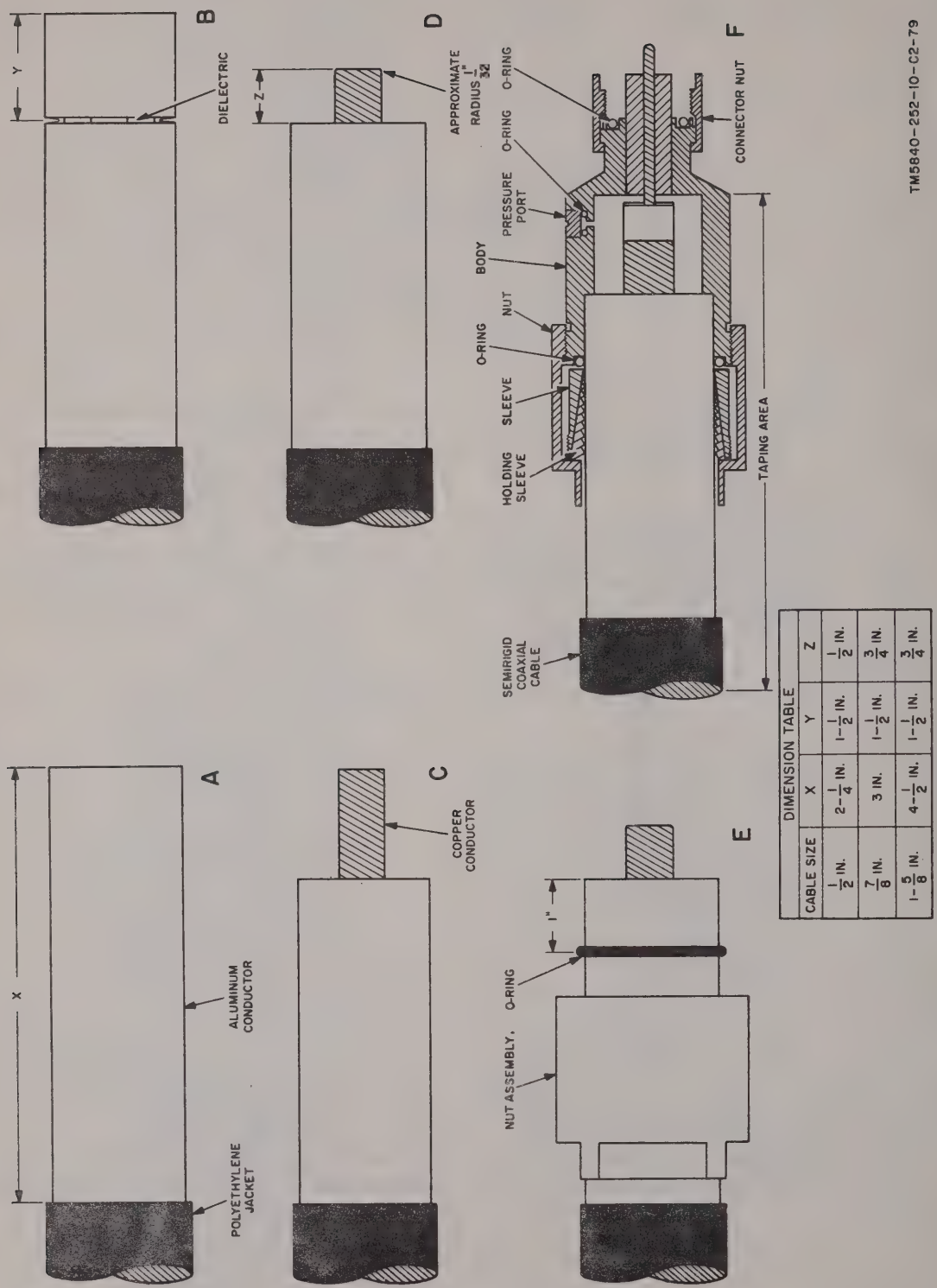
(6) Referring to the table in figure 2–15, measure the distance Z (for a $\frac{7}{8}$-inch cable size) from the end of the aluminum conductor along the center copper conductor (D, fig. 2–15). Mark this distance on the center copper conductor. Using a hacksaw, cut the copper conductor at the mark previously made. Hold the cable or protect it in a manner that will guard against copper filings entering the dielectric tubing.

(7) File the outer end of the copper conductor to form a radius of approximately $\frac{1}{32}$-inch (D, fig. 2-15). Protect the cable as indicated in (6) above.

(8) Slide the nut assembly which consists of the nut, the holding sleeve, and a sleeve on the outer aluminum conductor. Place the O-ring approximately 1 inch from the end of the aluminum conductor (E, fig. 2–15). Align the body portion of the connector with the end of the cable and push it on. When properly seated, the undercut body portion of the connector should be just touching the O-ring.

(9) Thread the nut assembly onto the body. Use an open-end wrench on the body and a similar wrench on the nut assembly. The body portion of the connector must remain stationary in relation to the semirigid coaxial cable while the nut assembly only is rotated (F, fig. 2–15).

g. Interconnections of the reference and IFF coaxial cables from the bottom of the rotary joint are covered in the parent radar set manual.



DIMENSION TABLE			
CABLE SIZE	X	Y	Z
1/2 IN.	2-1/4 IN.	1-1/2 IN.	1/2 IN.
7/8 IN.	3 IN.	1-1/2 IN.	3/4 IN.
1-5/8 IN.	4-1/2 IN.	1-1/2 IN.	3/4 IN.

Figure 2-15. Assembly of cable W60.

Section II. INITIAL ADJUSTMENTS

Note. This section covers the initial adjustment procedure that should be performed after installation and prior to initial operation. Leveling the antenna pedestal and reference antenna is part of the installation procedure (paras 2–4*b* and 2–8*b*, respectively) and should be carefully done before these initial adjustments are made.

2–10. Direction of Three-Phase Motor Rotation

a. Antenna Drive Motor B801. Test the direction of rotation of antenna drive motor B801 as follows:

(1) With the main line switch (not supplied as part of the antenna group) turned off, connect a 115-volt, single-pole switch between terminals 02 and 02B on terminal board TB801 (fig. 2–12).

(2) Place the 60-cycle, three-phase main line switch (not supplied) and the antenna safety switch (fig. 3–1) in the ON position.

(3) *Momentarily* close the single-pole switch that was connected in (1) above, to apply power to the main drive motor through relay K801.

(4) Check to see that the antenna assembly rotates through the quadrants from north to east to south and to west. If the antenna rotates in the right direction, turn off the main line switch and proceed with *b* below. If the antenna rotates in the wrong direction (through the quadrants from north to west to south and to east), reverse the motor rotation by following the procedure given in (5), (6) and (7) below.

(5) Turn off the main line switch.

(6) At the load terminals of the main line switch, reverse the connections of any two of the three hot conductors (white, red, and green) of power input cable W80.

(7) Check again for correct rotation of the drive motor.

b. Lubrication Pump Motor B804.

(1) Loosen the 14 captive screws and remove the cover (23, fig. 8–2) from the top of the pedestal.

(2) *Momentarily* close the single-pole switch that was connected in *a*(1) above, to apply power to main drive motor B801 and lubrication pump motor B804 via relay K801.

(3) Check to see that lubricating oil is coming out of the oil discharge pipe shown in figure 2–16; if it is, replace the cover (23, fig. 8–2) and proceed with *c* below. If lubricating oil does not come out of the oil discharge pipe, reverse the direction of lubrication pump motor B804 by following the procedure given in (4), (5), and (6) below.

(4) Turn off the main line switch.

(5) At the lubricating pump motor connection box (on the motor), reverse the connections of any two of the three hot conductors.

(6) Check again for correct rotation of lubricating pump motor B804. Replace the cover (23, fig. 8–2).

c. Blower Motor B805.

(1) With the main line switch (not supplied as part of the antenna group) turned off, disconnect the single-pole switch that was connected between terminals 02 and 02B on terminal board TB801 (fig. 2–12). Reconnect this same switch between terminals X8H1 and X8A on terminal board TB801.

(2) Place the 60-cycle, 3-phase main line switch (not supplied) in the ON position.

(3) *Momentarily* close the single-pole switch that was connected in (1) above, to apply power to blower motor B805 via relay K807.

(4) Check to see that the direction of airflow is in through the fan blade end and out through the heater end of unit heater Z815 (fig. 7–6). If the rotation of blower motor B805 is correct, turn the main line switch (not supplied) off and remove the single-pole switch that was temporarily connected to terminals X8H1 and X8A on terminal board TB801. If the rotation of blower motor B805 is incorrect, reverse the direction of blower motor B805 by following the instructions given in (5) through (8) below.

(5) Turn off the main line switch (not supplied).

(6) At unit heater Z815, reverse the connections of any two of the three hot conductors.

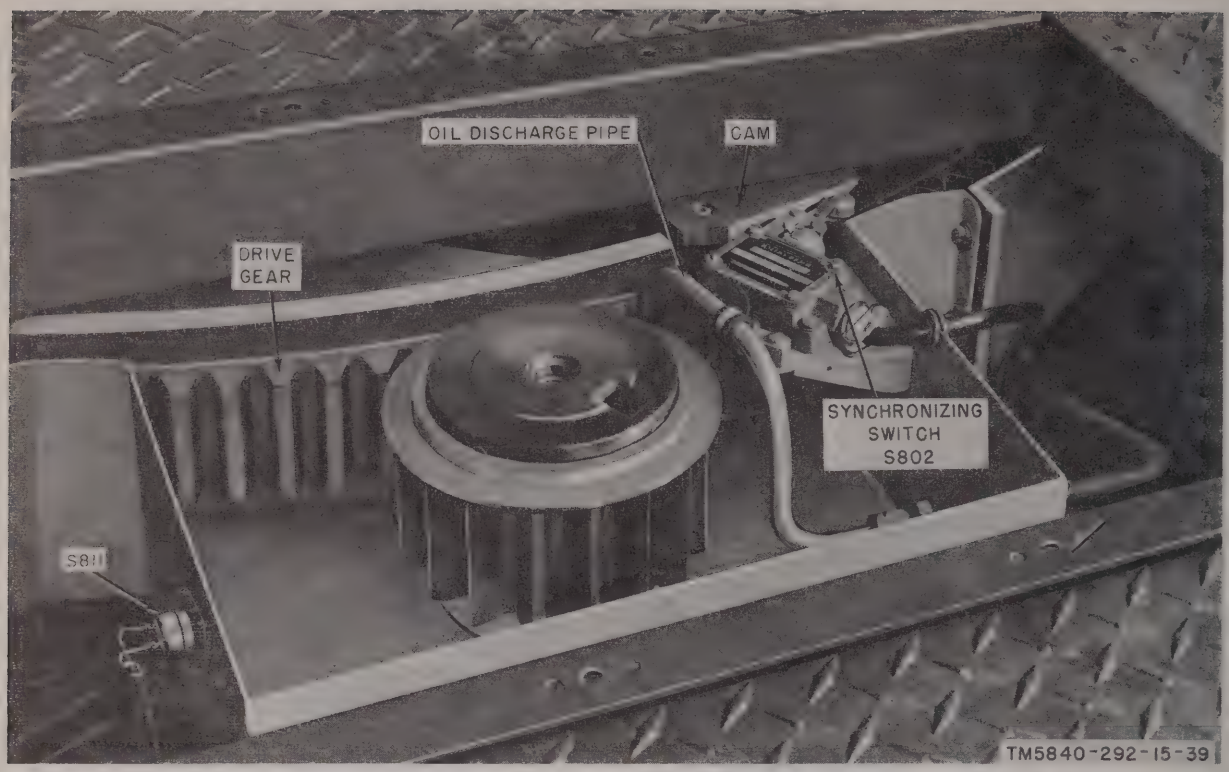


Figure 2-16. Synchronizing switch S802.

(7) Check again for correct rotation of blower motor B805.

(8) Turn off the main line switch (not supplied), and remove the temporarily installed single-pole switch that was connected to terminals X8H1 and X8A on terminal board TB801.

2-11. Resolver and Synchro Alignment

a. Adjustment of Resolver Amplifier Output Voltage. Adjust the resolver amplifier series-regulated power supply by performing the following procedure:

(1) Loosen the four screws that hold the sunshade to the resolver amplifier brackets (fig. 8-1); remove the sunshade.

(2) Loosen the eight captive screws that hold the cover onto the front of the resolver amplifier.

(3) From the parent radar set, apply 400-cycle power to the pedestal and measure the voltage between terminal 3 and terminal 5 (ground) on A826TB1 (fig. 2-19).

(4) If a +250-volt reading is not obtained, unlock and adjust A826R1 (fig. 2-19) for a reading of +250 volts.

(5) Lock A826R1, replace the resolver amplifier cover and sunshade, and remove the 400-cycle power from the pedestal.

b. Adjustment of Resolver B825. Resolver B825 in the main-antenna pedestal (fig. 2-17) is a one-speed resolver that provides main-antenna azimuth-position data to the Improved Nike-Hercules Air Defense Guided Missile System for synchronizing the rotation of the Nike ppi sweep with the antenna rotation. To gain access to B825, loosen the 10 captive screws on the cover to the right of the resolver amplifier and remove the cover. Adjust resolver B825 by establishing communication with Nike personnel and following the step-by-step procedure given in (1) through (6) below.

Note. A telephone jack (J825) is located on the resolver amplifier. This jack connects to a telephone circuit linking the pedestal to the Nike system. Necessary telephone equipment that mates with phone jack J825 may be obtained from Nike personnel.

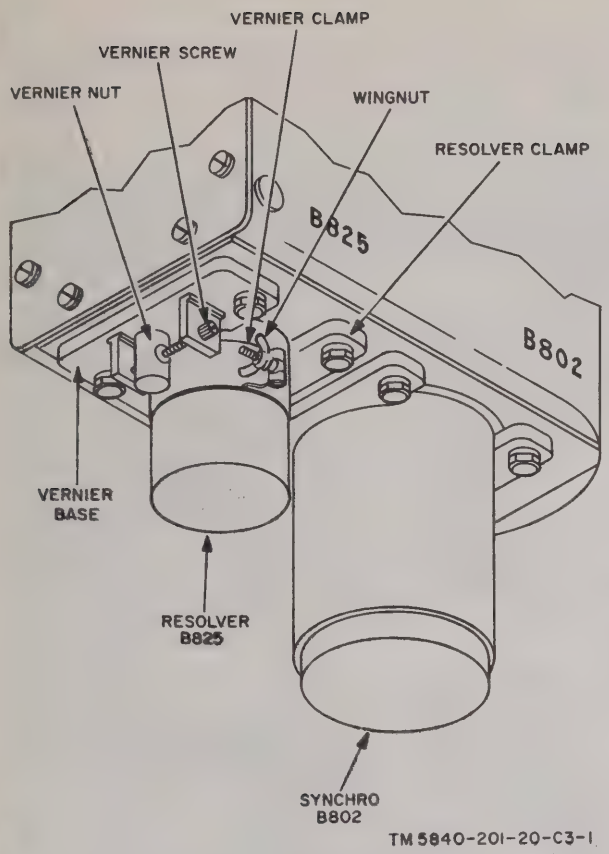


Figure 2–17. Resolver B825.

(1) On the vernier clamp, loosen the wingnut enough to permit centering the vernier nut ((2) below).
(2) Adjust the vernier screw to position the vernier nut midway between the stops.
(3) On the resolver clamp and the vernier base, loosen the four captive screws enough to permit rotating resolver B825.
(4) Perform the *coarse* adjustment by carefully rotating the body of resolver B825. When Nike personnel indicate that the best coarse setting has been obtained, retighten the wingnut on the vernier clamp; be careful to prevent B825 from rotating.
(5) Perform *the fine* adjustment by carefully turning the vernier screw in small increments until Nike personnel indicate that the best setting has been obtained.
(6) Tighten the four captive screws on the resolver clamp and vernier base, and replace the pedestal cover.

c. Adjustment of Synchro B803. Align 24-speed, 400-cycle synchro B803 by following the step-by-step procedure given below.

(1) Turn the motor coupling by hand and rotate the antenna clockwise (from north to east to south and west) until the cam on the drive gear is centered on the actuator of synchronizing switch S802 (fig. 2–16).
(2) Disconnect the leads from terminals S1, S2, and S3 of 24-speed synchro B803 (fig. 2–18).
(3) Connect Multimeter TS–352B/U (or equivalent), set to the 250-volt ac scale, to terminals S1 and S3 on synchro B803.
(4) Loosen the two clamps that hold the body of synchro B803.
(5) From the parent radar set, apply 400-cycle power to the pedestal.
(6) Carefully turn the body of synchro B803 until the TS–352B/U reading is zero. Switch the TS–352B/U to a lower voltage scale to obtain an accurate zero.
(7) Connect a temporary jumper between terminals R2 and S1, and TS–352B/U between terminals R1 and S2 on synchro B803; observe the TS–352B/U reading. If the voltage indicated is less than 115 volts ac, the synchro is correctly zeroed. If, however, the voltage indicated is more than 115 volts ac, the body of synchro B803 must be rotated 180° and zeroed again.
(8) Tighten the synchro holding clamps and recheck for zero ac voltage across S1 and S3.
(9) Remove the 400-cycle power from the pedestal, disconnect the TS–352B/U, and reconnect synchro B803.

d. Adjustment of Synchro B802. Align single-speed, 60-cycle synchro B802 (fig. 2–18) by following the step-by-step procedure given in (1) through (9) below.

Note. When aligning synchro B802, note that the leads connected to terminals S1 and S3 on B802 are reversed; thus, the lead labeled S1 is connected to terminal S3 on B802, and the lead labeled S3 is connected to terminal S1.

(1) Turn the motor coupling by hand and rotate the antenna clockwise until the reflector is pointing toward true north.

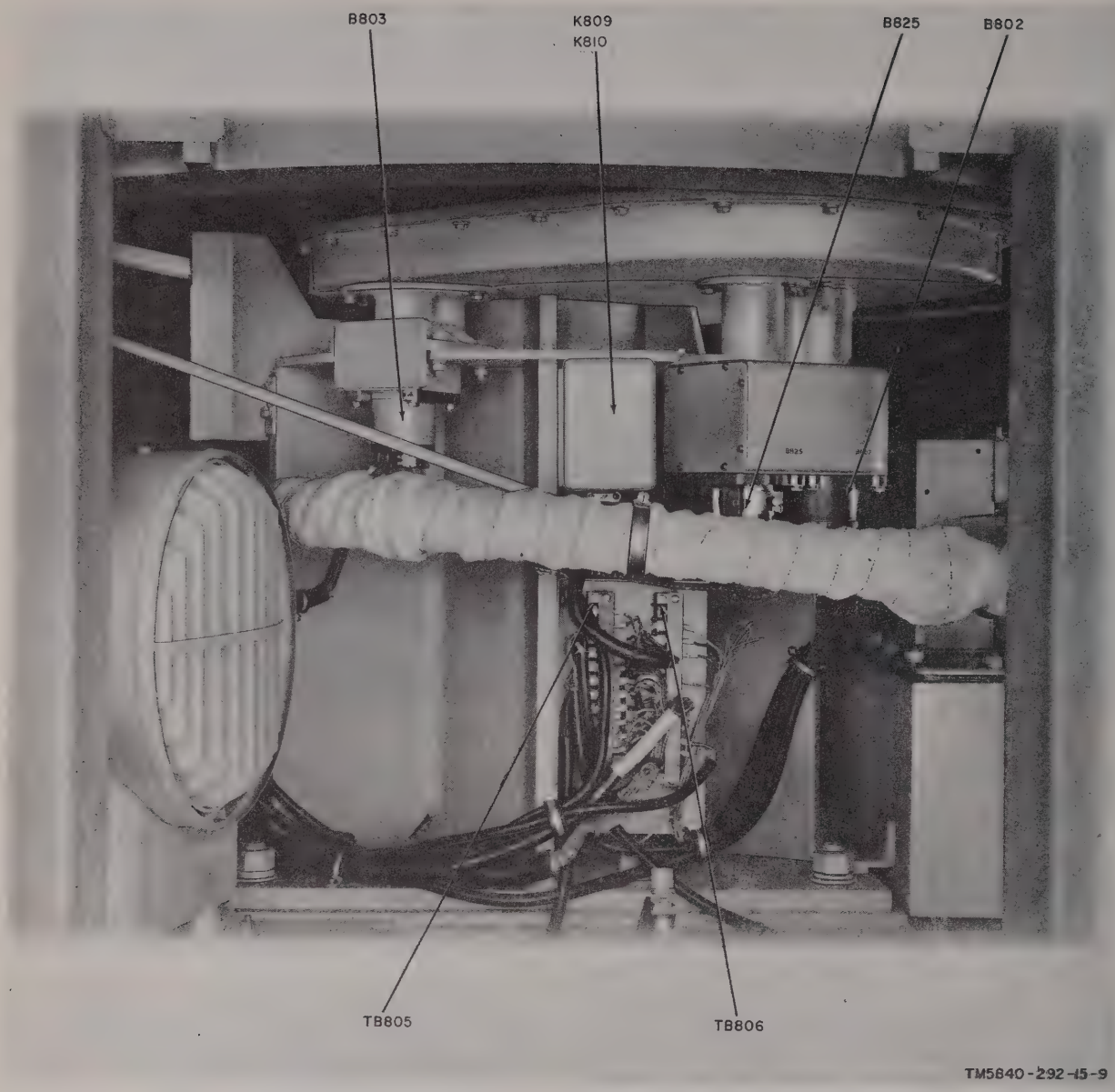


Figure 2–18. Antennna posttionmg synchros.

(2) Disconnect the leads from terminals S1, S2, and S3 from single-speed synchro B802.
(3) Connect a TS–352B/U (250-volt scale) to terminals S1 and S3 on synchro B802.
(4) Loosen the two clamps that secure the body of synchro B802.
(5) From the parent, radar set, apply 60-cycle power to the single-speed synchro B802 circuit.
(6) Carefully turn the body of synchro B802 until the TS–352B/U reads zero. Use the meter on the lowest practicable voltage scale to obtain an accurate zero.
(7) Connect the TS–352B/U (250-volt scale) between terminals R1 and S2 on synchro B802, and observe the voltmeter reading. If the voltage indicated is less than 115 volts, the synchro is correctly zeroed. If,

however, the voltage indicated is greater than 115 volts, the body of synchro B802 must be rotated 180° and zeroed again.

(8) Tighten the synchro holding clamps, and recheck for zero ac voltage across S1 and S3.

(9) Remove the 60-cycle power from the synchro B802 circuits, disconnect the TS–352B/U, and reconnect the leads to synchro B802. (Again observe that the lead labeled S1 is connected to terminal S3, and the lead labeled S3 is connected to terminal S1.)

2–12. Azimuth Scale Alignment

Adjust the position of the azimuth scale so that it correctly indicates the heading of the radar beam from the reflector.

a. Rotate the antenna reflector until it is facing a known true azimuth bearing, which may be obtained by observing a target with a known bearing from the antenna site.

b. Loosen the capscrews (147, fig. 8–9) that fasten together the two halves of the azimuth scale (151 and 152).

c. Rotate the azimuth scale until the azimuth pointer (175) coincides with the correct scale reading. Tighten the capscrews and secure the azimuth scale together.

2–13. Fuse Location Chart

Fuses that protect the electrical parts and internal wiring of the antenna group are mounted in the distribution box (fig. 7–1), resolver amplifier (fig. 2–19), and reduced voltage starter (fig. 7–2). All fuseholders, with the exception of F801, F802, F803, F812, and F813, contain a normally off blown-fuse indicator which glows when the fuse is blown. Those fuses that do not have the blown-fuse-indicator-type holders have external indicators which glow when the respective fuse is blown. Check each fuse listed below to make sure that the proper fuse is located in each clip or holder.

Caution: **To avoid damage to the equipment, do not use fuses with ratings other than those specified in the chart.**

Reference symbol	Figure ref	Description	Function
F801	7–1	Fuse, cartridge, 60-amp, 250V, T.L.	Primary power input (phase A).
F802	7–1	Fuse, cartridge, 60-amp, 250V, T.L.	Primary power input (phase B).
F803	7–1	Fuse, cartridge, 60-amp, 250V, T.L.	Primary power input (phase C).
F804	7–1	Fuse, cartridge, 30-amp, 250V.	Unit heater Z815 (phase A).
F805	7–1	Fuse, cartridge, 30-amp, 250V.	Unit heater Z815 (phase B).
F806	7–1	Fuse, cartridge, 30-amp, 250V.	Unit heater Z815 (phase C).
F807	7–1	Fuse, cartridge, 2-amp, 250 V, T.L.	Control and signaling (phase C).
F808	7–1	Fuse, cartridge, 10-amp, 250V, T.L.	Convenience outlet (phase C).
F809	7–1	Fuse, cartridge, 8-amp, 250V, T.L.	Lubrication pump motor B804 (phase A).
F810	7–1	Fuse, cartridge, 8-amp, 250V, T.L.	Lubrication pump motor B804 (phase B).
F811	7–1		Lubrication pump motor B804 (phase C).
F812	7–1	Fuse, cartridge, 15-amp, 250V.	Speed-reducer heater Z816 (phase A).
F813	7–1	Fuse, cartridge, 15-amp, 250V.	Speed-reducer heater Z816 (phase B).
F825	2–19	Fuse, cartridge, 3-amp, 250V, T.L., MIL-type F02G3R00A.	Resolver amplifier.
F1	7–2	Fuse, cartridge, 8-amp, 250V, T.L., MIL-type F09G8R00B.	Reduced voltage starter.

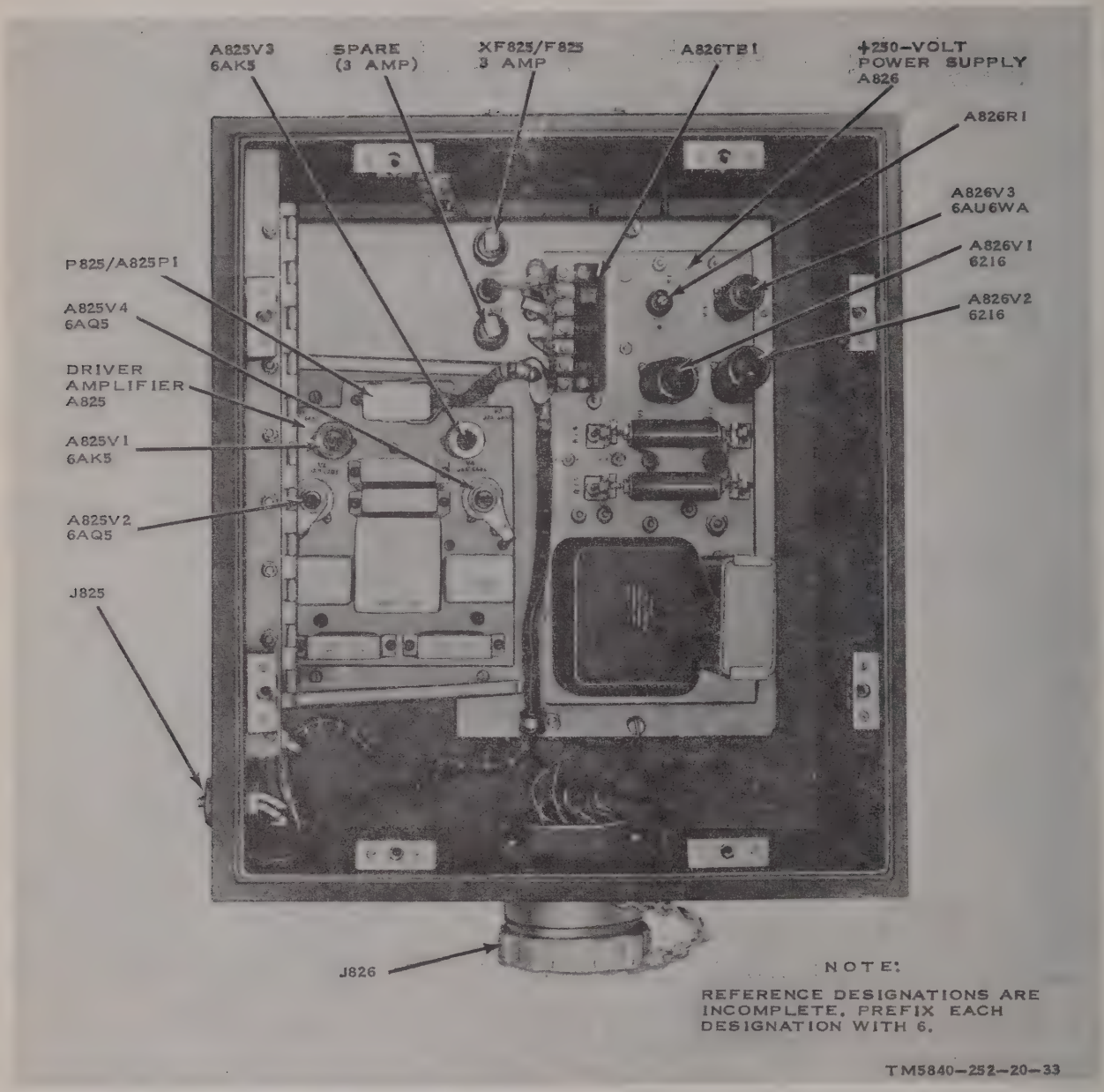


Figure 2-19. Resolver amplifier details.

CHAPTER 3

OPERATION

3–1. Controls, Instruments, and Signals, and Their Uses

The controls, instruments, and signals (indicators) on the distribution box, resolver amplifier, and reduced voltage starter, together with their functions, are listed below.

a. Distribution Box (fig. 3–1).

Control	Function
Antenna safety ON-OFF switch.	In the ON position, permits remote control of antenna rotation. In the OFF position, opens control circuit to drive motor contactor K801.
GLOWS WHEN SAFETY SWITCH ON INDICATOR.	When glowing, indicates remote control circuits are activated.
F804 through F811, DS801 through DS803, and DS812 and DS813 indicators.	When glowing, indicate blown fuse.

b. Resolver Amplifier (fig. 2–19).

Control	Function
F825	When glowing, indicates blown fuse.
A826R1	When rotated, sets voltage level of resolver amplifier power supply at +250 volts.

c. Reduced Voltage Starter (fig. 7–2).

Control	Function
F1	When glowing, indicates blown fuse.

d. Rotor Assembly (fig. 2–2).

Control	Function
Circular level (fig. 2–2)	Indicates plumb condition of pedestal.

3–2. Operation Under Usual Conditions

Provisions are made for starting and stopping the main antenna by controls at the parent radar set. Monitoring circuits and connections are available for use by the parent radar set to indicate the following functions: antenna rotation, oil flow, and air pressure. Refer to the parent radar set manuals for specific details relating to remote control and monitoring devices.

a. Apply 120/208-volt, 3-phase, 60-cycle power to the antenna pedestal via the main line switch (not supplied). The antenna safety switch on the distribution box is set to OFF. The temperature is above 30° F (−1.1° C).

(1) Oil flow switch S804 remains closed (no oil flow) and 120 volts is present between terminals 01 and 02G on terminal board TB801 for use by the parent radar set to indicate no oil flow.

(2) Antenna drive motor B801, oil pump motor B804, and blower motor B805 are all inoperative.

b. On the distribution box, set antenna safety switch S801 to the ON position.

(1) The indicator lamp above this switch should glow.

(2) The remote control circuit (available to the parent radar set) is also completed so that, when connections are made and the circuit between terminals 02 and 02B of terminal board TB801 is completed, antenna rotation can be controlled via relay K801.

c. The circuit between terminals 02 and 02B of terminal board TB801 is closed by controls at the parent radar set.

(1) Relay K801 is energized, and the antenna starts rotating slowly. After approximately 10 seconds, the speed increases to 6 rpm.

(2) One hundred and twenty volts is available

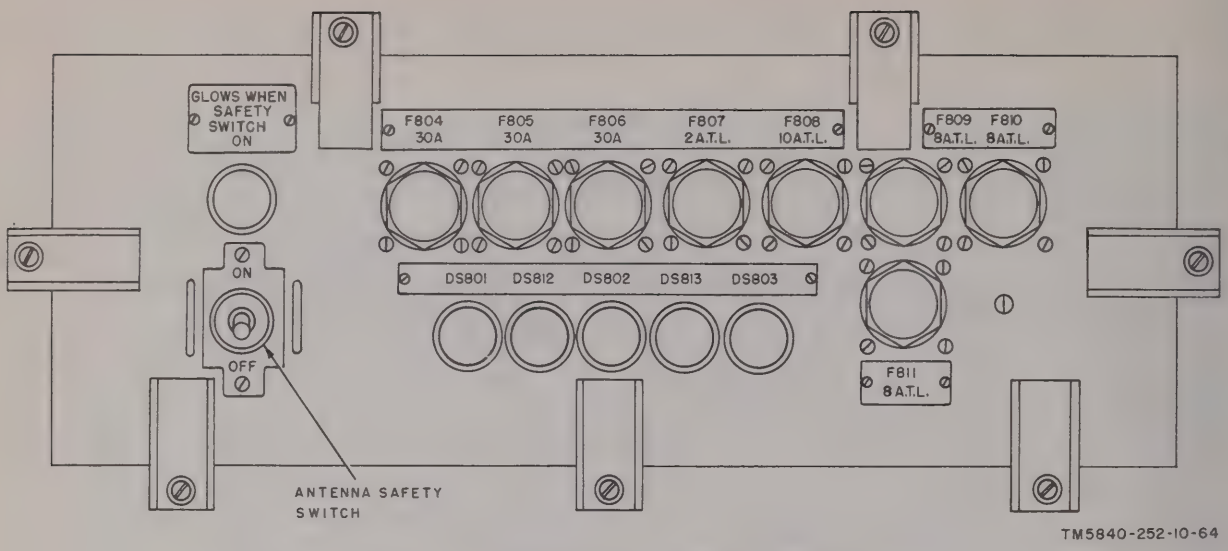


Figure 3–1. Distribution box, controls and indicators.

on terminals 01 and 02F of terminal board TB801 for use by the parent radar set to indicate antenna rotation.

(3) Oil pump motor B804 operates, oil flow is present, oil flow switch S804 opens, and 120 volts is removed from terminals 01 and 02G on terminal board TB801.

d. Air pressure switch S805 is normally open; it closes when an air pressure of 10.5 psig (or greater) is present in the antenna pedestal air-pressurizing system. When the antenna is rotating and the air pressure is above 10.5 psig, 120 volts is present between terminals 01 and 02J on terminal board TB801 for use by the parent radar set to indicate the presence of air pressure.

e. Loss of antenna rotation will remove the 120-volt antenna rotation signal from terminals 01 and 02F of terminal board TB801 and the 120-volt air pressure signal from terminals 01 and 02J of terminal board TB801.

f. Loss of air pressure will remove the 120-volt air pressure signal from terminals 01 and 02J of terminal board TB801.

g. Loss of oil flow will place a 120-volt oil flow signal on terminals 01 and 02G of terminal board TB801.

Caution: **If the *oil flow* signal (120 volts on terminals 01 and 02G of terminal board TB801) is present after the the antenna rotation signal (120 volts on terminals 01 and 02F of terminal board TB801) is present, immediately stop the antenna from rotating and refer to paragraph 3–3*a*. Failure to stop rotation may cause damage to gears from lack of lubrication.**

3–3. Operation Under Unusual Conditions

Antenna Groups OA-4040/FPS-69 and OA-6957/FPS-71 are designed for operation in temperatures from −65° to +150° F (−54° to −65.6° C.). The procedures recommended for certain unusual or extreme operating conditions are outlined below.

a. Operation in Low Temperatures. Heaters and heater control circuits are included in the pedestal so that the antenna group can be operated in low temperatures. No special starting or operating procedures are necessary when operating under low-temperature conditions. When the antenna starts to rotate, the *oil flow* signal may be present for up to 2 hours at the low operating temperature extreme, −65° F. (−54° C.), indicating lack of lubricating oil flow. With the main line three-phase switch (not supplied) in the ON position, unit heater Z815 is activated inside the antenna pedestal when the temperature falls below 30° F. (−1.1° C.). This heater operates whether the antenna is rotating or not.

Caution: **If the *oil flow* signal remains present after the antenna starts rotating during the lubricating oil warmup period, stop the antenna rotation and wait a short time before restarting**

the antenna. Repeat this procedure until the *oil flow* signal ceases after the antenna is rotating.

b. Operation Under Extremely Dusty Conditions. When operating the antenna group under extreme conditions of dust or blown sand, it is important to keep moving parts, such as gears and shafts, as free from sand and dirt as possible. More frequent lubricating oil changes are desirable when operating under these conditions (para 5–9).

CHAPTER 4

OPERATOR'S MAINTENANCE INSTRUCTIONS

4–1. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of Antenna Group OA–4040/FPS–69 or OA–6957/FPS–71 are listed below, together with a reference to the paragraphs covering the specific maintenance functions. The duties assigned do not require tools or test equipment other than those issued with the antenna group.

a. Daily maintenance service and inspection (para 4–4).

b. Weekly maintenance service and inspection (para 4–5).

c. Cleaning (para 4–6).

4–2. Operator's Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in this paragraph and paragraphs 4–3 through 4–6 cover routine systematic care and cleaning essential to proper upkeep of this equipment when it is used separately. When this equipment is used as part of a *set* or *system,* follow the procedure established in the *set* or *system* manual.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (paras. 4–4 and 4–5) outline the functions to be performed at specific intervals. For equipments operated separately, these checks and services are designed to maintain Army electronic equipment in a combat-serviceable condition, in good general (physical) condition, and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the *References* column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, higher level maintenance or repair is required. Records and reports of these checks must be made in accordance with TM 38–750.

4–3. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 are required on a daily and weekly basis.

a. Paragraph 4–4 specifies checks and services that must be accomplished daily under the special following conditions:

(1) When the equipment is initially installed.
(2) When the equipment is reinstalled after removal for any reason.
(3) At least once each week if the equipment is maintained in standby condition.

b. Paragraph 4–5 specifies *additional* checks and services that must be performed *once* each week.

Warning: **Observe the radiation hazard warning listed in the parent radar set manuals before performing any preventive maintenance.**

4–4. Operator's Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedures	References
1	Completeness	See that the equipment is complete	See parent radar set manual.
2	Exterior surfaces	*a.* Clean the antenna pedestal *b.* Inspect painted surfaces for bare spots, rust, and corrosion	*a.* Para 4–6. *b.* None.
3	Distribution box ON-OFF switch.	While making the operating checks (sequence No. 5), observe that the mechanical action of the switch is smooth, and free of external or internal binding.	

Sequence No.	Item to be inspected	Procedures	References
4	Intercabling and connectors.	Check all interconnecting cables and connectors for cracks and breaks. Replace cables that have cracked or broken connectors.	Para 2–9.
5	Antenna group	Check to see that the antenna group operates normally as outlined in paragraph 5–14.	Para 3–2.

4–5. Operator's Weekly Preventive Maintenance Checks and Services Chart

Item to be inspected	Procedures	References
Antenna and antenna pedestal	Inspect the antenna and antenna pedestal for rust, corrosion, and physical damage. Check to see that all bolts, nuts, and washers are present and properly tightened, and mountings show no evidence of weakness or deformity. Inspect the antenna pedestal for oil leaks and unusual noise.	None.

4–6. Cleaning

Inspect the exteriors of the antenna, the antenna pedestal, and the reference antenna. The exterior surfaces should be clean, and free of dust, dirt, grease, and fungus.

a. Remove rust and loose dirt with a clean soft cloth.

Warning: **Prolonged breathing of cleaning compound is dangerous; make certain that adequate ventilation is provided. Cleaning compound is flammable; do not use near a flame or arcing contacts. Avoid contact with the skin; wash off any that spills on your hands.**

b. Remove grease, fungus, and ground-in dirt with a cloth dampened (not wet) with Cleaning Compound (Federal stock No. 7930–395–9542).

CHAPTER 5

ORGANIZATIONAL MAINTENANCE

Section I. ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

5–1. General

The tools, supplies, and test equipment necessary to perform organizational maintenance are authorized by the maintenance allocation chart in the parent radar set manual. Additional tools and testing facilities are supplied with the radar set with which the antenna group is used.

5–2. Tools and Materials Required and Supplied

a. The tools and materials required for organizational maintenance of the antenna group are listed below.

(1) Screwdriver (large size).
(2) Ohmmeter (Multimeter TS–352/U or equivalent).
(3) Sandpaper No. 000.
(4) Lint-free cloth.
(5) Cleaning Compound (Federal stock No. 7930–395–9542).
(6) Tool Kit TK–166/FPS.

b. The tools that are normally supplied with the parent radar set will usually be adequate for maintenance at the organizational maintenance level.

Section II. PREVENTIVE MAINTENANCE

5–3. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all levels concerned with the equipment, and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance services and inspections of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 at the organizational level are made at monthly and quarterly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule of the parent radar set.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38–750.

5–4. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance and inspection chart (para 5–5) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly maintenance should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly maintenance performed on it. Equipment in limited storage (requires service before operation) does not require monthly maintenance.

Warning: **Observe the radiation hazard warning listed in the parent radar set manuals before performing any preventive maintenance.**

5–5. Organizational Monthly Preventive Maintenance Checks and Services Chart

Item to be inspected	Procedure	Reference
Lubrication ----	Lubricate the equipment (para 5–9).	Para 5–9.

5–6. Quarterly Maintenance

Quarterly preventive maintenance checks and services on Antenna Groups OA–4040/FPS–69 and OA–6957–FPS–71 are required. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38–750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (para 5–7), in the sequence listed.

5–7. Organizational Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedures	References
1	Completeness	See that the equipment is complete	See the parent radar set manual.
2	Installation	See that the equipment is properly installed	Paras 2–4 through 2–13.
3	Cleanliness	See that the equipment is clean	Para 4–6.
4	Preservation	Check all surfaces for evidence of fungus. Remove rust and corrosion, and spot-paint bare spots.	Para 5–8.
5	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310–4.
6	Modifications	Check DA Pam 310–4 to determine whether new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All ROUTINE MWO's must be scheduled.	TM 38–750 and DA Pam 310–4.
7	Distribution box ON-OFF switch.	While making the operating checks (sequence No. 15), observed that the mechanical action of the switch is smooth, and free of external or internal binding.	
8	Intercabling and connectors	Check all interconnecting cables and connectors for cracks and breaks. Replace cables that have cracks or broken connectors.	Para 2–9.
9	Resolver amplifier and reduced voltage starter.	Check to see that all bolts, nuts, and washers are present and properly tightened, and that tightened, and that mountings show no evidence of weakness or deformity.	
10	Antenna and antenna pedestal, and reference antenna.	Inspect the antenna, antenna pedestal, and reference antenna for rust, corrosion, and physical damage. Check to see that all bolts, nuts, and washers are present and properly tightened, and that mountings show no evidence of weakness or deformity. Inspect the antenna pedestal for oil leaks and unusual noise.	
11	Interior surfaces	*a.* Tighten switches, terminal blocks, terminal connections, and mountings.	*a.* None.
		b. Clean the interior of the antenna pedestal, resolver amplifier, distribution box, and reduced voltage starter. Check for adequacy of moistureproof and fungiproof treatment.	*b.* Para 4–6.
		c. Inspect the interior of the antenna pedestal, resolver amplifier, distribution box, and reduced voltage starter for corrosion and rust; touch up paint if necessary.	*c.* Para 5–8.
		d. Inspect gaskets for damage, resilience, and proper fit.	*d.* None.
12	Interior electrical, mechanical, and plumbing items.	*a.* Inspect oil pump motor B804 (fig. 7–4), antenna drive motor B801 (fig. 7–3), speed reducer (fig. 7–5), synchros B802 and B803 (fig. 2–18), and resolver B825 (fig. 2–18) for overheating and unusual noises.	

Sequence No.	Item to be inspected	Procedures	References
		b. Inspect the distribution box (fig. 7–1), resolver amplifier (fig. 2–19), and reduced voltage starter (fig. 7–2) terminal blocks for loose connections, cracks, and breaks. *c.* Inspect the shock mounts for physical damage and for proper cushioning action. *d.* Inspect the antenna pedestal lubricating oil sump and associated plumbing for oil leaks. *e.* Inspect the air lines, fittings, waveguide flanges, and EIA coaxial cable connector flanges for air leaks or damaged gaskets, and for proper fit. *f.* Inspect the unit heater for proper operation.	Para 5–12*d*.
13	Pluckout items	*a.* Check to see that all indicator lamps and lenses are properly seated and correctly tightened. *b.* Check to see that all tubes are properly seated and that tube shields and heat sink shields are in place.	
14	Distribution box, resolver amplifier, and reduced voltage starter fuses.	See that all operating fuses are of the correct value. Check spare fuses for correct value and quantity.	Para 2–13.
15	Antenna group	Check to see that the antenna group operates normally as outlined in paragraph 5–14.	Para 5–14.
16	Spare parts	Check all spare parts (operator and organizational) for general condition and proper storage. There should be no evidence of overstock, and all shortages will be on valid requisitions.	See parent radar set manual.

5–8. Cleaning and Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB SIG 364.

Caution: **Do not paint the radome material that encases the main antenna horn or the radome material that encircles the reference antenna.**

Section III. LUBRICATION

5–9. Lubrication Instructions

a. General.

(1) The type of lubricant to be used, the interval, and the specific instructions for lubrication are given in figures 5–1 through 5–4.

(2) Do not use gasoline or carbon tetrachloride as a cleaning fluid for any purpose. When parts of the equipment are being serviced, clean them with cleaning compound.

(3) Do not use excessive amounts of grease.

(4) Be sure that the lubricants and points to be lubricated are clean, and free of sand, grit, or dirt. These abrasives are the chief cause of gear wear. Use cleaning compound to clean all parts. Wipe the parts dry with a lint-free cloth.

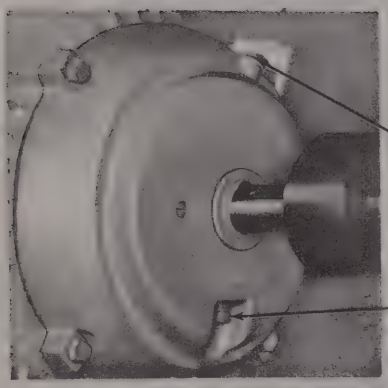
b. Specific Lubrication Instructions.

(1) Perform all lubrication procedures outlined in figures 5–1 through 5–4 at least once a year.

(2) Check the level of the oil in the sump and the speed reducer at monthly intervals.

(3) A 2-foot length of $\frac{3}{4}$-inch hose is furnished with the antenna group to assist in draining the lubricant from the lubrication pump gear head, the lubrication oil sump, and the speed reducer.

(4) To oil the felt seal (fig. 5–4) at the base

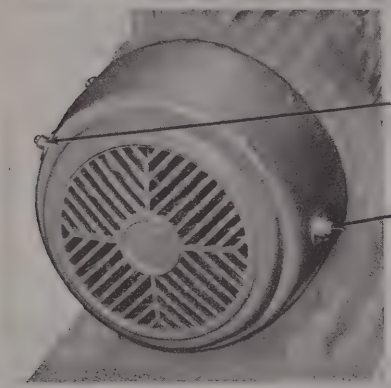


INTERVAL LUBRICANT

Y GR

MAIN DRIVE MOTOR, SHAFT END

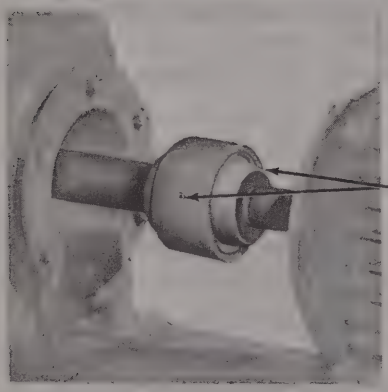
1. REMOVE GREASE PLUG AND INSTALL GREASE FITTING. REMOVE DRAIN PLUG.
2. INJECT NEW GREASE WITH PRESSURE GUN UNTIL ALL OLD GREASE HAS BEEN EXPELLED.
3. RUN MOTOR FIVE MINUTES.
4. REPLACE DRAIN PLUG AND GREASE PLUG.



Y GR

MAIN DRIVE MOTOR, FAN END

1. REMOVE GREASE PLUG AND INSTALL GREASE FITTING. REMOVE GREASE EJECTOR DRAIN PLUG.
2. INJECT NEW GREASE WITH PRESSURE GUN UNTIL ALL OLD GREASE HAS BEEN EXPELLED. TO ASSIST EXPULSION WORK GREASE EJECTOR PLUNGER BACK AND FORTH SEVERAL TIMES.
3. RUN MOTOR FIVE MINUTES.
4. REPLACE GREASE EJECTOR DRAIN PLUG AND GREASE PLUG.



Y GR

SHAFT COUPLING

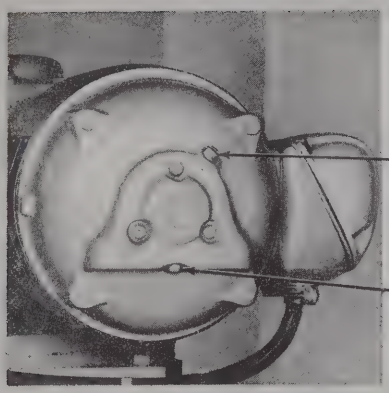
1. REMOVE TWO GREASE PLUGS AND INSTALL ONE GREASE FITTING.
2. INJECT NEW GREASE WITH PRESSURE GUN UNTIL ALL OLD GREASE HAS BEEN EXPELLED.
3. REPLACE PLUGS.

KEY

LUBRICANT		INTERVAL	
GR	GREASE-MIL-G-3278	Y	YEARLY

TM5047-42

Figure 5-1. Main drive motor B801 lubrication chart.

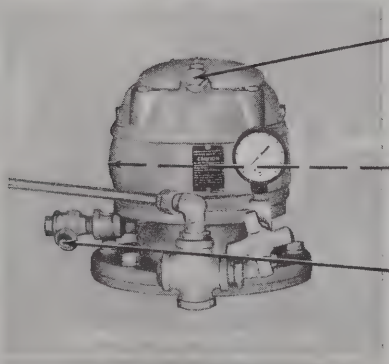


INTERVAL LUBRICANT

Y GR

LUBRICATION PUMP MOTOR

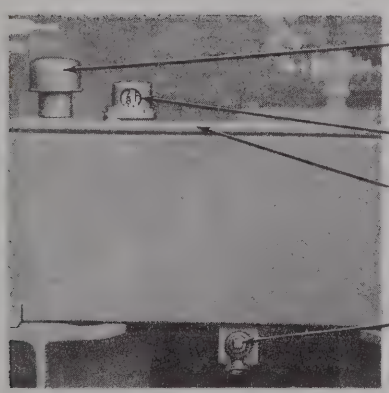
1. REMOVE GREASE PLUG AND INSTALL GREASE FITTING. REMOVE DRAIN PLUG.
2. INJECT NEW GREASE WITH PRESSURE GUN UNTIL ALL OLD GREASE HAS BEEN EXPELLED.
3. RUN MOTOR FIVE MINUTES.
4. REPLACE DRAIN PLUG AND GREASE PLUG.



Y GO

LUBRICATION PUMP GEAR HEAD

1. REMOVE VENT CAP, OPEN DRAIN COCK AND DRAIN LUBRICANT.
2. REMOVE FILL LEVEL PLUG.
3. CLOSE DRAIN COCK AND REFILL THROUGH VENT CAP HOLE UP TO FILL LEVEL HOLE ($3\frac{3}{4}$ PINTS).
4. REPLACE FILL LEVEL PLUG.



Y GO

LUBRICATION OIL SUMP

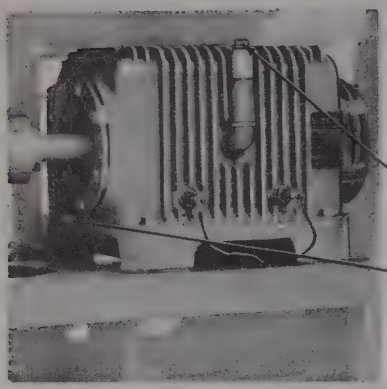
1. OPEN DRAIN COCK AND DRAIN LUBRICANT.
2. DISMOUNT SUMP COVER AND WASH OUT SUMP. USE CLEANING COMPOUND AND LINTLESS CLOTH. REMOVE ALL TRACES OF CLEANING COMPOUND.
3. REFILL SUMP WITH 20 GALLONS OF OIL.
4. WASH FILLER CAP WITH CLEANING COMPOUND AND DRY THOROUGHLY.
5. CHECK LEVEL GAUGE MONTHLY.

KEY

LUBRICANT		INTERVAL	
GR	GREASE-MIL-G-3278	Y	YEARLY
GO	OIL-MIL-L-6086A (M)		

TM5840-292-15-11

Figure 5-2. Oil sump lubrication chart.

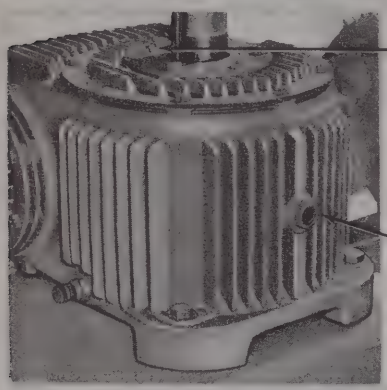


INTERVAL LUBRICANT

Y GO

SPEED REDUCER

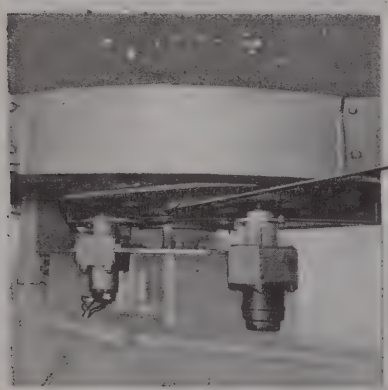
1. OPEN DRAIN COCK AND DRAIN LUBRICANT (YEARLY).
2. CLOSE DRAIN COCK AND REFILL THROUGH FILLER PLUG TO CENTER OF SIGHT GLASS (APPROXIMATELY $5\frac{1}{4}$ GALLONS).



Y GR

SPEED REDUCER ROLLER BEARING

APPLY GREASE SPARINGLY WITH GREASE GUN (GREASE FITTING). (SEE NOTE)



Y GR

SYNCHRO GEARS

1. CLEAN GEARS WITH LINTLESS CLOTH AND CLEANING COMPOUND. DRY THOROUGHLY.
2. LIGHTLY BUTTER TOOTH SURFACES WITH GREASE.

NOTE:
UNITS MODIFIED BY MWO 11-5840-243-30/1 HAVE AN EXTENDED GREASE FITTING ON THE SPEED REDUCER.

KEY

LUBRICANT		INTERVAL	
GO	OIL MIL-L-6086A (M)	Y	YEARLY
GR	GREASE MIL-G-3278		

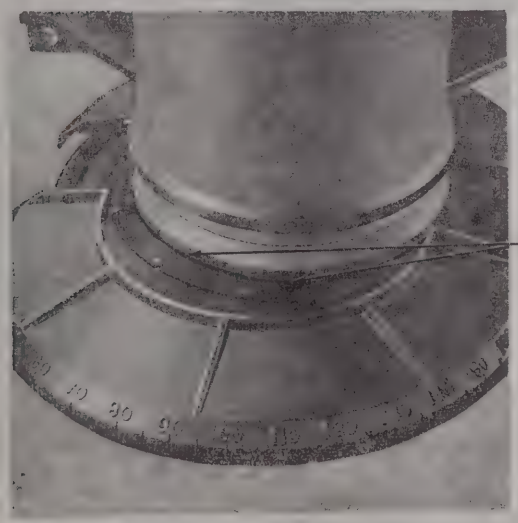
TM5840-292-15-12

Figure 5-3. Speed reducer and synchro gears lubrication chart.

INTERVAL LUBRICANT

Y GR — SPINDLE BEARINGS

1. REMOVE DRAIN PLUGS 180° FROM FITTINGS.
2. INJECT NEW GREASE WITH PRESSURE GUN UNTIL ALL OLD GREASE HAS BEEN EXPELLED.
3. REPLACE DRAIN PLUGS.



Y GO — FELT SEAL

SATURATE FELT WITH OIL.

KEY

LUBRICANT		INTERVAL	
GR	GREASE MIL-G-3278	Y	YEARLY
GO	OIL MIL-L-6086A (M)		

TM5047-44

Figure 5-4. Rotor assembly lubrication chart.

of the rotor assembly, remove the halves of the azimuth scale as indicated below.

(*a*) Make a reference mark on the azimuth scale and the rotor assembly for use as a guide in reassembly.

(*b*) Loosen and remove the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{8}$-inch hexagonal-head screws, $\frac{1}{4}$-inch flat washers, $\frac{1}{4}$-inch lockwashers, and $\frac{1}{4}$-inch by 20 nuts.

(*c*) Remove the azimuth scale halves from the rotor assembly.

(*d*) Apply the oil, with a spouted oilcan, around the edge of the rotor assembly.

(*e*) Use the reference mark as a guide, and place the two azimuth scale halves in position on the rotor.

(*f*) Fasten the halves together with the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{8}$-inch hexagonal-head capscrews, twelve $\frac{1}{4}$-inch flat washers, six $\frac{1}{4}$-inch lockwashers, and six $\frac{1}{4}$-inch by 20 nuts.

(5) To lubricate the synchro gears (fig. 5–3), dismount the dustpan for access to the gears, as indicated below.

(*a*) Loosen and remove the ten $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews, $\frac{1}{4}$-inch flat washers, and $\frac{1}{4}$-inch lockwashers that attach the dustpan section (A865) to the dust cover (A863), figure 8–21.

(*b*) Loosen and remove the six $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews and $\frac{1}{4}$-inch flat washers that attach the dustpan section (A865) to the synchro housing and the synchro and resolver gear housing, and remove the dustpan section.

(*c*) To reassemble the dustpan to the dust cover, carefully mate the two together, insure that the rubber gasket between the two sections is properly seated, and reverse the procedures given in (*a*) and (*b*) above.

5–10. Parts Lubricated by Manufacturer

The ball bearings located in the synchro drive assembly, synchro housing assembly, and triple-channel rotary joint are factory lubricated with Grease, Aircraft and Instruments (GL) and do not require subsequent lubrication.

Section IV. TROUBLESHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

5–11. General

a. Troubleshooting at the organizational level is limited to the localizing of defective parts that are readily replaceable at the organizational level (fuses, lamps, tubes, cables, etc). The procedures outlined are designed to determine first the defective parts and then the nature of the fault. If the fault can be determined through organizational procedures, the corrective measure or the need for repair at a higher maintenance level is indicated. If the fault cannot be determined through organizational procedures, reference is made to the necessary maintenance instructions.

b. The techniques used for organizational troubleshooting include visual inspection, operational tests, and simple continuity checks. The material is presented in the order that the repairman would normally use in servicing this equipment. When the procedures indicated are not sufficient to determine the source of trouble, troubleshooting at a higher maintenance level will be required.

5–12. Visual Inspection

a. Possible Faults. Operational failure of the antenna group is usually caused by one or more of the following faults:

(1) Open antenna safety switch.

(2) Fault in the parent radar set control circuits.

(3) Blown fuses.

(4) Power source failure.

(5) Worn, broken, or disconnected power or control cable.

(6) Incorrect interunit cable connections (para 2–9) and interconnections to the parent radar set.

(7) Faulty relay in either the distribution box or the reduced voltage starter.

(8) Faulty drive motor.

(9) Obvious damage or mechanical abnormalities, especially of the antenna and rf line sections.

(10) Presence of dirt, corrosion, moisture, and

bits of wire and solder inside the equipment units.

(11) Loose tube shields and clamps, resulting in improperly seated tubes.

(12) Unlighted tube filaments, indicating defective or improperly seated tubes.

(13) Cracked or charred resistors.

(14) Bulging or leaking electrolytic capacitors.

(15) Blistering of paint and other signs of overheating on transformers, chokes, potentiometers, and motors.

(16) Discoloration of the insulation on wires. Under heavy overleads, it is possible for some wires to melt and produce no visible evidence other than a slight discoloration of the insulation surrounding the wire.

b. Routine Procedure. When failure occurs and the cause is not immediately apparent, check as many of the above items as is practicable before starting a detailed examination of the unit. Do not disassemble the unit without some knowledge of the operational symptoms. If possible, obtain information from the operator of the equipment regarding performance at the time the trouble was noted.

c. External Control Circuit Fault. If an apparent fault seems to be located in the control circuits external to the 40-foot antenna, consult the parent radar set manual regarding antenna control circuits.

d. Air Pressure. When loss of air pressure is indicated (para 6–10*e*), request the parent radar set personnel to verify normal operation of the dry-air source. Check the air pressure at the gage shown in figure 8–16. Check all pressurized joints and fittings with a solution of soapy water and apply with a brush. Where necessary, replace faulty gaskets, O-rings, or fittings to correct the air leakage.

5–13. Trouble Sectionalization

Sectionalization of trouble in the antenna group aids in determining in what functional circuit the trouble lies. The functional circuit groups include those of the drive motor, the unit heater, the lubrication pump, the controls, relays, monitoring signals, the reduced voltage starter, and the resolver amplifier.

a. Check to see that the equipment operates normally. Refer to the equipment performance checklist (para 5–14) for normal operating indications.

b. Failure of the antenna to rotate may indicate blown fuses or a faulty relay in the reduced voltage starter or drive motor circuit in the distribution box.

c. Failure of the unit heater in low temperatures may result in serious damage to the equipment due to inadequate lubrication. Such failure indicates trouble in the unit heater circuit.

d. Failure of the lubrication system may cause damage to the equipment.

e. Failure of the antenna positioning system (synchros B802 and B803 and resolver B825) involves the use of power and reference signals from the parent radar set and from the Improved Nike-Hercules Air Defense Guided Missile System. Inform the cognizant personnel of the associated suspected faulty equipment and work with them until the fault has been sectionalized.

5–14. Equipment Performance Checklist

The equipment performance checklist is a systematic check of the equipment performance in order to isolate trouble in the antenna group with a minimum of waste effort. Operate the equipment as directed in the checklist and look for the normal indications listed; if an abnormal indication is obtained, act on the corrective measure outlined in the final column of the checklist. It is assumed that all other major components of the parent radar set are energized and functioning properly during the performance check of the antenna group.

Item No.	Item	Action or condition	Normal indication	Corrective measure
1	Fused line switch (not supplied with equipment) connected between power input cable W80 and power source.	Set at off position and take necessary action to make power available at switch.		
2	See note 1 below.			

Item No.	Item	Action or condition	Normal indication	Corrective measure
3	Antenna safety switch on distribution box.	Set at OFF.		
4	Cabling	Cable connections properly made (para 2–9).		
5	Antenna rotate control at parent radar set.	Set at stop position. See note 2 below.		
6	Fused line switch (not supplied).	Place in ON position	If outside temperature is below 30° F. (—1.1° C.), heater blower motor B805 blows warm air, immersion heaters HR811 and HR812 in oil sump are energized, and wraparound heaters on oil-return line (HR815 and HR816) are energized.	Check fuses at line switch (not supplied). Check fuses F804, F805, and F806. Check relay K807. Check thermal switch S809 at lubricating oil sump. Check outside temperature-sensing thermostat S810. Check heater thermostat switch S808.
			Oil pressure signal (120-volt, 60-cycle) present on terminals 01 and 02J of TB801.	Check fuse F807 and oil flow switch S804.
			Antenna rotation signal (120-volt, 60-cycle) not present on terminals 01 and 02F of TB801.	Refer to paragraph 6–10*c*.
			Air pressure signal (120-volt, 60-cycle) not present on terminals 01 and 02J of TB801.	Refer to paragraph 6–10*e*.
7	Antenna safety switch on distribution box.	Set to ON	GLOWS WHEN SAFETY SWITCH ON warning lamp glows.	Check lamp DS804. Check switch S801.
8	At parent radar set, operate control to close circuit between terminals 02 and 02B of TB801.	Set for antenna rotation ***Caution:* Place in stop position immediately if normal indications are not obtained.**	Antenna rotation signal (120-volt, 60-cycle) is present on terminals 01 and 02F of TB801.	Check fuses F801, F802, and F803. Refer to paragraph 6–10*b*.
			Antenna rotates clockwise smoothly and reaches its normal rotating speed of between 5 and 7 rpm in approximately 10 seconds after it is set to rotate.	Check fuse F1 on reduced voltage starter. Refer to paragraph 6–10*d*.
			If drip pan is above 20° F. (—6.7° C.) or oil in sump is above 130° F. (54.4° C.), oil pump motor B804 runs and discharges oil onto gears; oil pressure gage shows between 5 and 10 psi	Check fuses F809, F810, and F811. Refer to paragraph 6–12.
			Oil pressure signal (120-volt, 60-cycle) not present on terminals 01 and 02J of TB801.	Refer to paragraph 6–12*c*.

Item No.	Item	Action or condition	Normal indication	Corrective measure
			Air pressure signal (120-volt, 60-cycle) present on terminals 01 and 02J of TB801.	Check air pressure at parent radar set. Check pressure gage (MP850) inside pedestal. Check all air line connections and waveguide flanges. Refer to paragraph 6–10*e*.
9	At parent radar set, necessary controls, or operations.	Energize synchros B802 (115-volt, 60-cycle) and B803 (115-volt, 400-cycle).	B802: 115-volt, 60-cycle between terminals 96 and 97 of TB803.	Refer to parent radar set manuals.
			B803: 115-volt, 400-cycle between terminals 98 and 99 of TB804.	Refer to parent radar set manuals.
			Applicable ppi sweep at parent radar set rotates in synchronism with antenna.	Refer to paragraph 6–13.
			Tubes in resolver amplifier glow (power supply and amplifier).	Check fuse F825. Refer to paragraph 6–16.
10	At Nike, necessary control or operation to provide 4-kc reference signal for resolver B825.	Connect oscilloscope across terminals 18 and 31 on jack J825.	4-kilocycle sinusoidal reference voltage (approximately 70 to 80 volts peak to peak) is displayed on oscilloscope.	Refer to parent radar set manual.
11	At +250-volt, power supply, 115 volts present on terminals 1 and 2 of terminal board A826TB1.	Using multimeter, measure ac voltage between terminals 1 and 2 on terminal board A826TB1.	Multimeter reads approximately 115 volts ac.	Check fuse F825.
12	Antenna positioning data to Nike-Hercules; azimuth and/or range data incorrect, N-S and/or E-W data faulty or not present.	Using oscilloscope, and measuring from rear of jack J825, check for presence of 4-kilocycle resolver output signals as follows: Measure E-W output between pins 14 and 28 of jack J825; measure N-S output between pins 10 and 25 of jack J825.	4-kilocycle resolver output signals, amplitude of which depends on position of resolver rotor, will be displayed on oscilloscope at both sets of terminals.	Adjust resolver B825 to correct for azimuth misalignment. Refer to parent radar set manual for correcting range data. Check connections on resolver B825. Check and adjust +250-volt power supply subassembly A826 in resolver amplifier. If output of A826 is abnormal, check V1, V2, and V3 on this subassembly by substitution. Troubleshoot +250-volt power supply A826 (para 6–16). If resolver signals are missing at pins 14 and 28 of jack J825, check V3 and V4 on driver amplifier subassembly A826.

Item No.	Item	Action or condition	Normal indication	Corrective measure
				If resolver signals are missing at pins 10 and 25 of jack J825, check V1 and V2 on driver amplifier subassembly A826. Troubleshoot driver amplifier subassembly A825 (para 6–15). Check for proper lubrication or binding gears.
13	At parent radar set, operate control to open circuit between terminals 02 and 02B of TB801.	Set to stop antenna rotation.	Antenna coasts smoothly to a stop in about 30 seconds. Antenna rotation signal (120-volt, 60-cycle) not present between terminals 01 and 02F of TB801. Air pressure signal (120-volt, 60-cycle) not present between terminals 01 and 02J of TB801 (whether pressurized or not). Oil pressure signal (120-volt, 60-cycle) present between terminals 01 and 02J of TB801. Heater units and blower motor B805 may or may not be operating, depending on temperature. GLOWS WHEN SAFETY SWITCH ON warning lamp still glowing.	
14	Antenna safety switch on distribution box.	Set to OFF----------	GLOWS WHEN SAFETY SWITCH ON warning lamp still glowing. Oil pressure signal (120-volt, 60-cycle) present between terminals 01 and 02J of TB801. Heater units and blower motor B805 may or may not be operating, depending on temperature.	
15	Fused line switch (not supplied).	Place in OFF position----	Oil pressure signal (120-volt, 60-cycle) not present between terminals 01 and 02J of TB801. Heater units and blower motor B805, if operating, will stop.	

Notes:

1. Depending on the status of the parent radar set and the Nike equipment, the following voltages may exist in the 40-foot antenna:
   a. 115-volt, 400-cycle power present between terminals 98 and 99 on terminal board TB804 from the parent radar set.
   b. 115-volt, 60-cycle power present between terminals 96 and 97 on terminal board TB803 from the parent radar set.
   c. Reference signal of 4 kc between pins 18 and 31 on jack J826 on the resolver amplifier from the Nike equipment.
2. The remote control for starting and stopping antenna rotation closes the circuit between terminals 02 and 02B on terminal board TB801 for starting, and opens the circuit for stopping.

CHAPTER 6

FUNCTIONING OF ANTENNA GROUP

Section I. INTRODUCTION

6–1. Block Diagram

Figure 9–4 is a block diagram of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71. This block diagram shows the electrical functioning of the major parts of the 40-foot antenna. Functionally, the antenna group may be divided into three parts: the rf system, the power distribution and control system, and the antenna positioning system.

6–2. System Operation
(fig. 6–3)

a. Rf System. The rf power from the parent radar set is conducted to the waveguide-to-coaxial transition at the bottom of the pedestal, through a run of the rectangular waveguide. A coaxial rotary joint at the center of the pedestal conducts the rf power from the lower waveguide-to-coaxial transition to a similar transition at the top of the pedestal. A line of waveguide from this upper transition feeds the antenna horn. The rf energy from the antenna horn strikes the surface of the reflector and is radiated in a narrow beam. The return echo signals are received by both the main and reference antennas. These echo signals are conducted through their respective rotary joint conductors of the rf system to the parent radar set receiving system. The rf system incorporates transmit-receive components which make it possible to transmit and receive by use of the same main antenna. A three-channel rotating joint in the rf system makes 360° azimuth rotation of the main antenna possible. In addition, rf signals from IFF equipment are connected to a third rotary conductor at the bottom of the lower transition, passed up through the rotary joint, and conducted to a dipole at the antenna horn. These signals are radiated from the dipole. The rf energy from the dipole strikes the surface of the reflector and is radiated into a narrow beam.

b. Power Distribution and Control System. Power from a 120/208-volt, 3-phase, four-wire supply is applied to the power distribution and control system. This system supplies three-phase power to drive motor B801 through motor control relay K801 and reduced voltage starter (unit 13), lubricating oil pump motor B804, and unit heater Z815. The reduced voltage starter applies approximately 65 percent of the line voltage to antenna drive motor B801 for the first 10 seconds of operation, and then switches the entire line voltage to the drive motor. Drive motor B801 rotates the antenna spindle through the speed reducer and the antenna drive assembly. Lubrication oil pump motor B804 drives a pump which furnishes a lubricating oil bath for the large gear on the rotating assembly and the pinion gear on the speed reducer. Excessive oil from the gears is returned to the pump by gravity flow. A thermostat prevents operation of the lubricating oil pump motor when the temperature of the lubricating oil in the sump drops below +10° F. (−12.2° C.). Unit heater Z815, which includes a heating coil and a fan, is connected to the three-phase power distribution. A thermostat in the lubricating oil sump controls the operation of the heating unit. The unit heater operates when the outside temperature is below 30° F. (−1.1° C.), and the lubricating oil is below 130° F. (54.4° C.). A power source of 115 volts at 400 cycles is provided by the parent radar set for operating +250-volt power supply A826 and the filament in driver amplifier A825.

c. Antenna Positioning System. A single-speed, 4-kilocycle (kc) resolver (B825), a single-speed, 60-cycle synchro (B802), and a 24-speed, 400-cycle synchro transmitter (B803) are geared to the rotating assembly. The resolver excitation voltage is received from the Improved Nike-Hercules Air Defense Guided Missile System; the antenna positioning data derived from the resolver is amplified by driver amplifier A825 and returned to Nike. Synchros B802 and B803 receive their excitation voltage

from the parent radar set, and the antenna positioning data derived from these synchros is returned for use by the parent radar set and associated equipment.

Section II. RF SYSTEM

6–3. Waveguide

Radiofrequency energy is conducted from the parent radar set transmitting system to the base of the pedestal through a hollow rectangular waveguide which also provides a path for the target return echoes from the antenna to the parent radar set. The detailed analysis of the propagation of magnetic and electric fields in a waveguide is given in TM 11–673.

6–4. Waveguide-to-Coaxial Transition

Energy is coupled from the waveguide to a coaxial line by use of waveguide-to-coaxial transition. One type of transition, which consists of a quarter-wave antenna stub supported at the opposite wall, is illustrated in A, figure 6–1. The energy traveling down the waveguide excites this stub, which is positioned with respect to the waveguide end plate so that maximum pickup is obtained. The doorknob transition illustrated in B, figure 6–1, is the actual type of transition used. It functions generally the same as the stub feed in A, figure 6–1 but is less frequency sensitive for broadband application and has greater power-handling capabilities. The smooth contours of the stub and the rounded edge of the transition reduce the field intensity for improved performance at higher power levels.

6–5. Rotary Joint

a. A coaxial rotary joint is used to permit efficient transfer of rf energy to the rotating assembly of the antenna. Figure 6–2 illustrates the operating principle of the type of rotary joint used in this equipment.

b. The two parts of the coaxial outer conductor are separated slightly and overlap. The slots between the overlapping pieces (A to B to C) form an effective one-half wavelength which reflects a short circuit at the place where the inner walls are close together. Thus, an effective continuity is created at the point where the two parts of the outer coaxial conductor meet. The same principle of operation holds true for all three channels of the triple-channel rotary joint.

c. The relationship of the various conductors to their functions and to each other is shown in figure 6–3. The main channel has a waveguide-to-coaxial transition at the top and bottom of the rotary joint, and a coaxial type transmission line between the two transitions.

(1) For Antenna Group OA–6957/FPS–71 (fig. 8–30), the inner coaxial conductor for the main channel also serves as the outer coaxial conductor for the IFF channel, and the inner coaxial conductor for the IFF channel serves as the outer conductor for the reference channel.

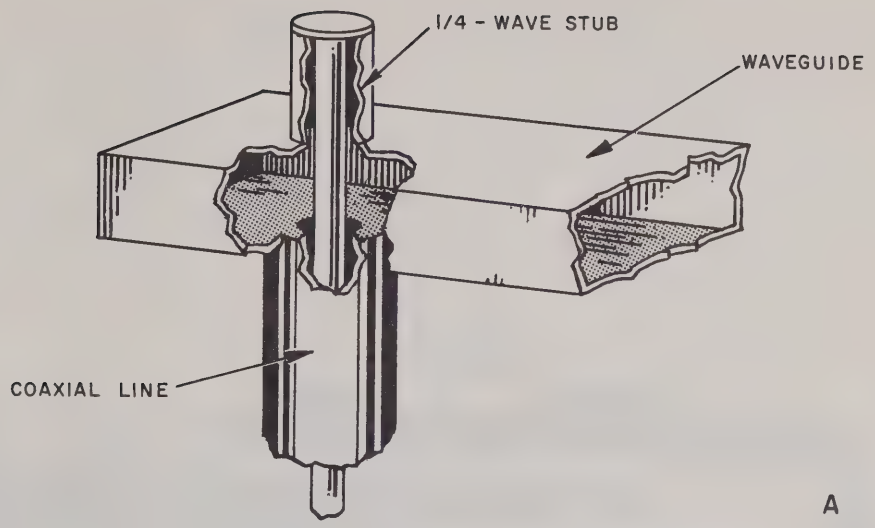
(2) For Antenna Group OA–4040/FPS–69 (fig. 8–29), the inner coaxial conductor for the main channel is not used as the outer conductor for the IFF channel, but a separate outer conductor is provided for the outer conductor of the IFF channel. The inner conductor of the IFF channel serves as the outer conductor for the reference channel.

6–6. Antenna Horn

Energy is delivered from the waveguide to the reflector by means of the antenna horn. As energy is passed from a waveguide to space, it is necessary to match the impedance of free space to that of the waveguide to prevent reflections and standing waves. To effect this impedance match so that energy can be delivered to the reflector efficiently, the opening of the guide is flared like a funnel. This flared horn makes the waveguide radiate and accept rf energy with a minimum of reflections and losses.

6–7. Reflector

a. The reflector forms the rf energy from the antenna horn into a beam having a beam width at the half-power points of 1.4° in azimuth and 6.2° in elevation. The narrow beam width in the horizontal plane is formed by a parabolic curve in the reflector surface (fig. 6–4). With the antenna horn placed at the focal point, energy is projected to the reflecting surface. As each part of the wave front reaches the reflecting surface, its polarity is reversed and it is sent outward at an angle of reflection that is equal



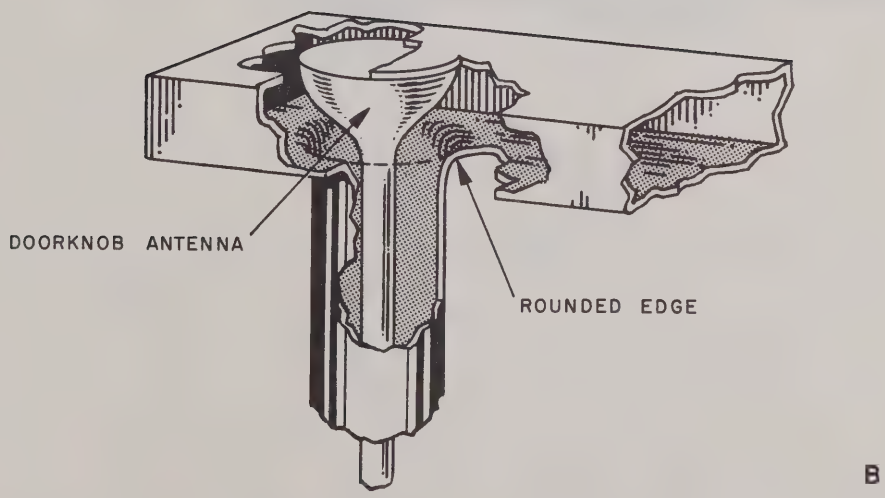


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Figure 6–1. Waveguide-to-coaxial transition.

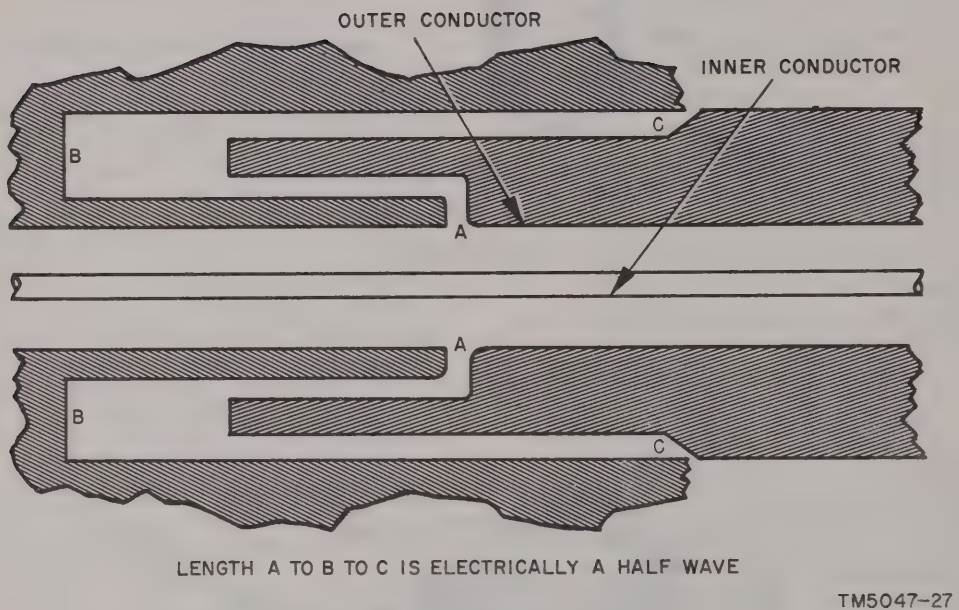
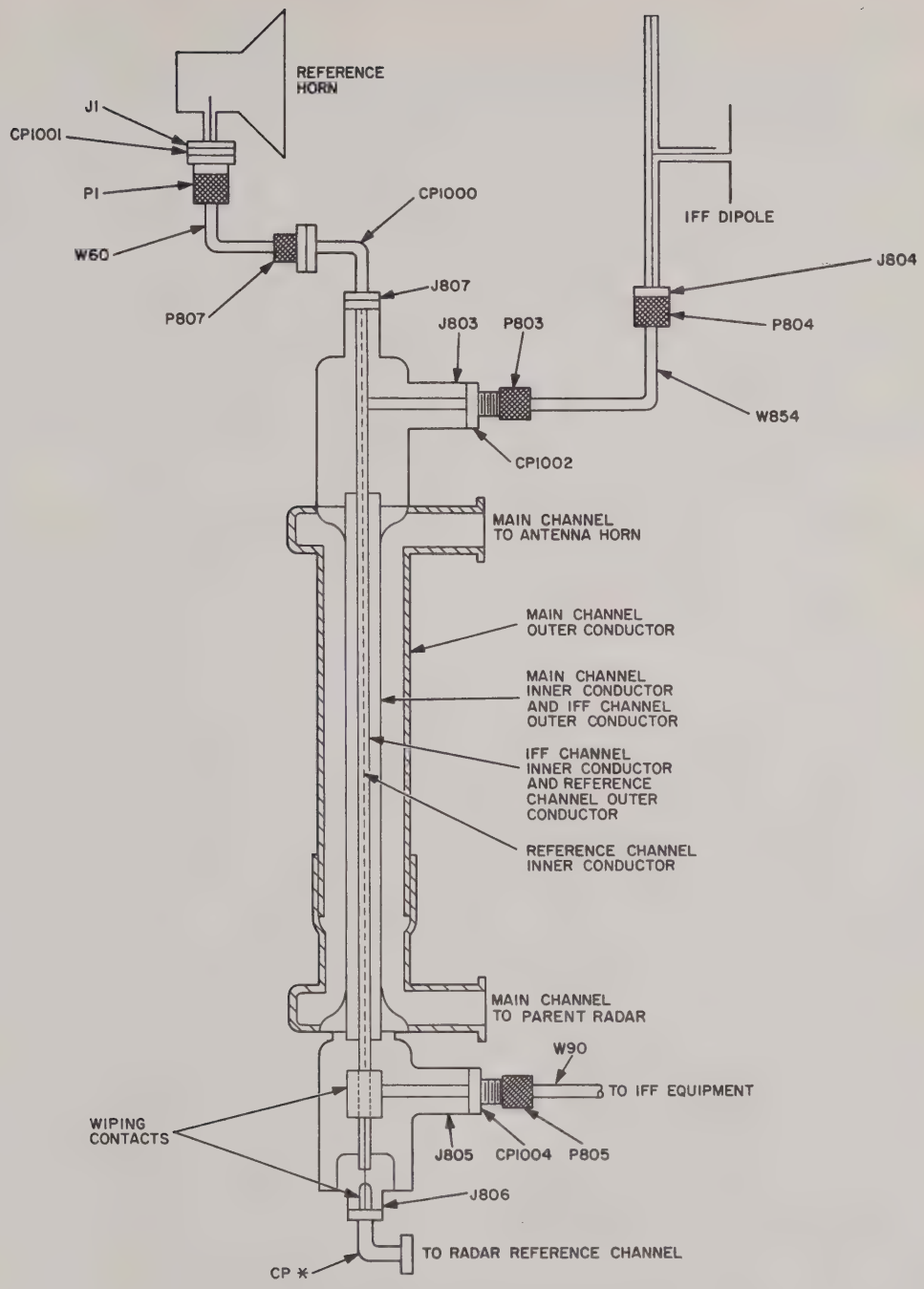


Figure 6-2. Principle of coaxial rotary joint.



NOTE:
* CP1013 FOR OA/4040/FPS/69
CP1003 FOR OA-6957/FPS-71

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Figure 6-3. Main, IFF, and reference rf systems.

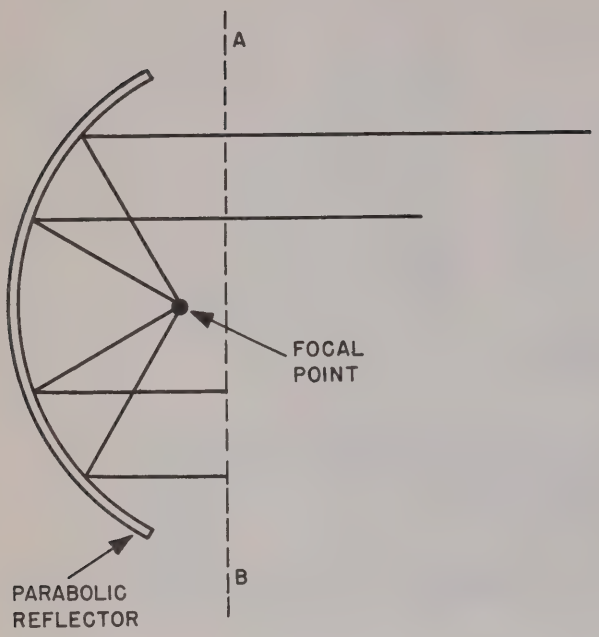


Figure 6-4. Principles of parabolic reflector.

to the angle of incidence. All parts of the wave front will arrive at line AB at the same time, since each path from the focal point to the reflector and line AB is the same length. Thus, with the parabolic reflector, all parts of the wave front are reflected in a direction parallel to the axis and are in phase at all points in a plane across the mouth of the parabola (line AB). A greater degree of directivity is obtained as the dimensions of the parabola with respect to the rf signal wavelength are increased.

b. A graph of the radiation beam pattern of the main antenna is shown in A and B, figure 6-5. Note that the beam width in the vertical plane is much wider than that in the horizontal plane for better coverage. The vertical contour of the reflector is designed to provide the desired vertical beam characteristic.

6-8. Reference Antenna

The reference antenna section (fig. 6-3) of the rf system is a receiving antenna only and does not conduct any of the transmitted rf energy. The reference antenna consists of a three-element, cavity-backed, slotted array, and is designed so that its gain in azimuthal directions is shaped to the sodelobe pattern of the main antenna. The result of this shaped beam pattern provides the parent radar set with a reference signal approximately equal in amplitude to the return echo received by the sidelobes of the main antenna. The received reference signal is conducted from the reference antenna to the top of the rotary joint via cable W60 through the innermost channel of the tripple-channel rotary joint to the parent radar set.

6-9. IFF Antenna System

a. Radiofrequency signals from IFF equipment are connected to the jack on the side of the triple-channel rotary joint at the bottom of the pedestal via cable W90 (fig. 6-3). The rotary joint, which contains rotary wiping contacts and choke joints for both the inner and outer conductors, connects from jack J805 on the bottom of the rotary joint to jack J803 on the top. Cable W854 connects from jack J803 on top of the rotary joint to jack J804 on the IFF dipole mounted on the antenna horn.

b. The IFF radiator is a center-fed half-wave antenna (dipole). One quarter-wave section of the dipole is connected to the coaxial center conductor, and the other quarter-wave section is connected to the outer conductor. The electrical characteristics of the dipole are designed so that the impedance at its feed point matches the 50-ohm characteristic impedance of cable W854.

c. IFF signals are radiated from the IFF dipole onto the reflector, which forms them into a narrow beam with characteristics similar to those of the main rf transmitted signal (para 6-7). The IFF replies that strike the reflector are directed to the IFF dipole at the focal point, from which they are fed to the IFF equipment.

Section III. POWER AND CONTROL CIRCUITS

6-10. Antenna Drive Motor Circuit

Figure 9-5 is a schematic diagram showing the antenna drive motor circuit of the pedestal. Operation of this circuit is as follows:

a. When antenna safety switch S801 is in the OFF position, motor contactor K801 cannot be activated by the remote antenna rotate control, and indicator lamp DS804 will not glow. The purpose of S801

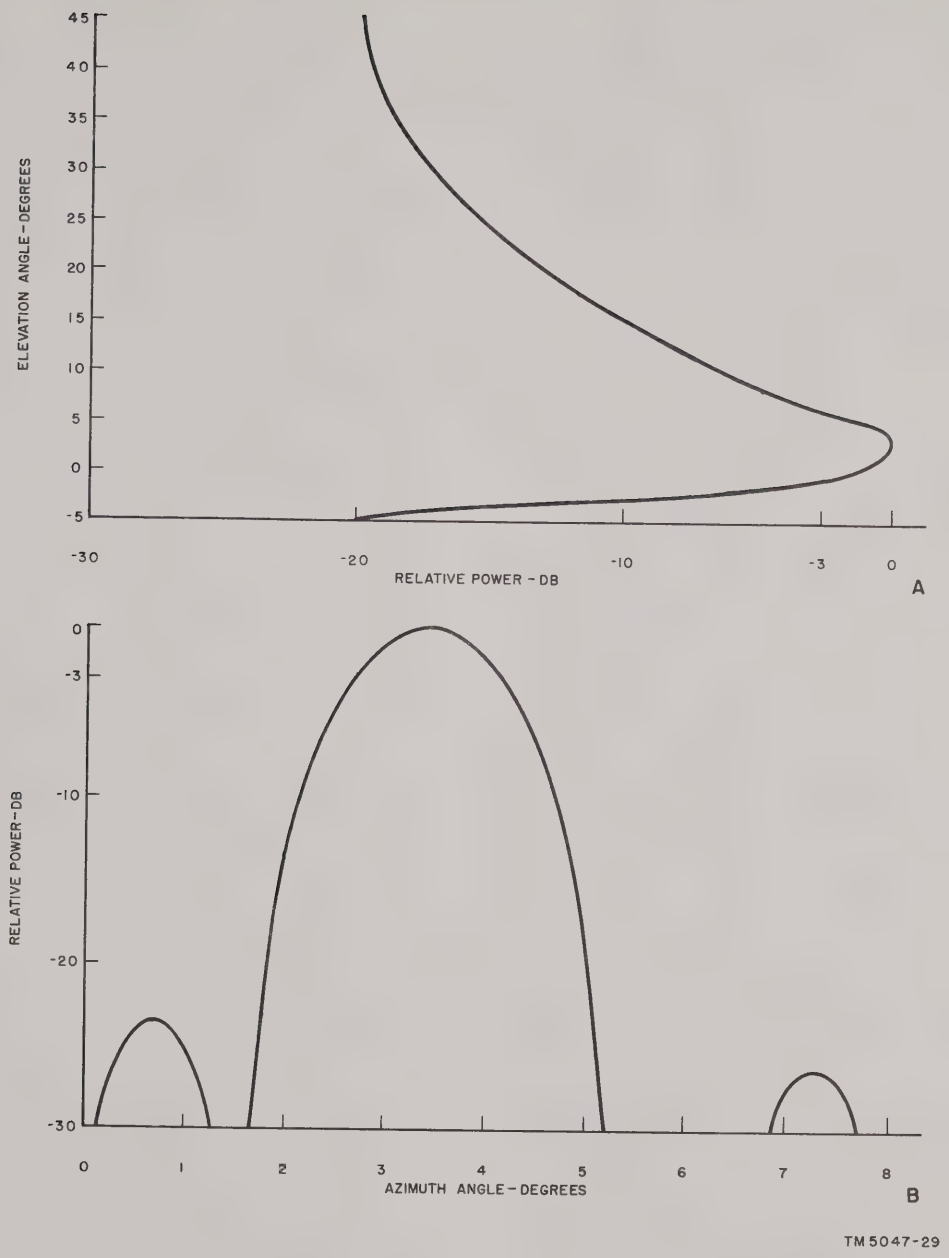


Figure 6-5. Beam characteristics of main antenna.

is to prevent accidental or unauthorized rotation of the antenna, especially during maintenance or preventive maintenance procedures. When S801 is set to ON, DS804 glows to show that the antenna rotation can be turned on by the remote antenna rotate control. Resistor R805 lowers the impedance across DS804 to prevent the neon lamp from glowing because of stray pickup induced in the conductors.

b. When the remote antenna rotate control is operated for antenna run, the coil of motor contactor K801 is energized through the closed contacts of S801. Three sets of contacts on contactor K801

close simultaneously, placing the reduced voltage starter directly across the three-phase line. Overcurrent protection for the reduced voltage starter, the windings of B801, and the motor leads is provided by delay fuses F801, F802, and F803. Each of these fuses has a normally off blown-fuse indicator that glows whenever its fuse is blown.

c. Relays K803, K804, and K805, connected between the three reduced voltage starter leads and ground, complete two circuits when all three phases are energized. One relay circuit (3–4 contacts) provides 120 volts for the antenna rotate signal and the air pressure signal. The second relay circuit (6–7 contacts) provides a closed circuit. The closing of these three relays operates the antenna rotate signal and the air pressure signal (when air pressure is above 10.5 lbs) for use by the parent radar set in monitoring the antenna group functions and for indicating to Nike that the antenna is rotating. If one or more of these relays is released (loss of one or more phases), the antenna rotate signal and the air pressure signal will be disconnected and the normally closed circuit (antenna rotating) to Nike will be opened. Resistors R802 and R804 shunt the antenna rotate signal and the air pressure signal to reduce stray pickup on the associated conductors.

d. The reduced voltage starter consists of a 10-second time delay relay, four control relays (one of which contains two thermal overload switches), a tapped autotransformer, and a fuse and fuse indicator lamp. The reduced voltage starter switches two different values of three-phase voltage to the windings of antenna drive motor B801. When the remote antenna rotate control is set to run, relays in the reduced voltage starter select an output voltage of approximately 78 volts ac per phase to the drive motor. After 10 seconds have elapsed, relays switch the entire line voltage of 120/208 volts ac to the antenna drive motor.

(1) When the remote antenna rotate control is set to run, 120/208-volt ac, 60-cycle, 3-phase power is applied to terminals T1, T2, and T3 of terminal board TB1. The three-phase power is applied to each leg of Y-connected tapped autotransformer T1. The common connection leg of T1 is completed by energizing reduced voltage start relay K1A.

(2) Relay K1A is energized as soon as three-phase power is applied to terminal T1 of TB1, in the following manner: from terminal T1 through fuse F1, contacts LB1 and LB2 of line voltage relay K1B, contacts 3 and 4 of control relay K5, the coil of reduced voltage start relay K1A, thermal elements OL2 and OL1 of overload relays K1D and K1C, and contacts 4 and 3 of the autotransformer overtemperature relay to ground. With relay K1A energized, contacts 3 and 2 apply 120 volts ac to energize reduced voltage start relay K2. At this point, contacts L1–T1, L2–T2, and L3–T3 of relay K2 are closed, and contacts T1–L1 and T3–L3 of relay K1A are closed. This condition completes a circuit through a portion of the tapped autotransformer so that only 65 percent of the 120/208-volt ac input power is applied to terminals 1–7, 2–8, and 3–9 of drive motor B801 to start the antenna rotating.

(3) At the same time that relays K1A and K2 are energized, 120 volts ac is applied to the coil of 10-second time delay relay K3 to start the 10-second delay. During the 10-second delay period, the antenna is operated at reduced power. After 10 seconds have elapsed, relay K3 becomes energized, and applies 120 volts ac through contacts 2 and 4 to energize control relay K5.

(4) When relay K5 is energized, 120 volts ac is transferred from contacts 3 and 4 to 5 and 6 of the relay. This action causes relay K1A to deenergize, and contacts 5 and 7 of K1A, in conjunction with closed contacts 5 and 6 of K5, supply a path for the 120-volt ac energizing voltage to line voltage relay K1B. As K1B is energized, contacts 5 and 4 close and apply 120 volts ac as a holding voltage for relay K1B. Late break contacts LB1 and LB2 of relay K1B open after contacts 5 and 4 make, to insure that the 120 volts ac is not removed from relay K5 until the holding voltage is applied to relay K1B. With relay K1B energized, relay contacts L1–T1, L2–T2, and L3–T3 (relay K1B) close to apply 120/208-volt ac, 60-cycle, 3-phase power direct to antenna drive motor B801. The antenna should reach a rotating speed of approxi-

mately 6 rpm, and relays K1A, K2, K3, and K5 should become deenergized.

(5) In addition to fuse F1, the reduced voltage starter contains two protective circuits. Autotransformer overtemperature relay K4, in conjunction with thermal switches located in T1, provides an interlock circuit which removes the common ground connection from relays K1, K2, K3, and K5 when the temperature of T1 exceeds 302° F. (150° C.). When the temperature exceeds 302° F. (150° C.), the thermal switches in T1 close, and apply 120 volts to energize relay K4. Contacts 3 and 4 open to remove the common ground and stop antenna rotation. If the remote antenna rotate control is not set to stop, or if main power is not removed from the pedestal, the reduced voltage starter will recycle through its 10-second starting period and the antenna will rotate at 6 rpm when the temperature causing the stoppage drops below the critical level. If the cause of overheating is not corrected, the antenna rotation will continue to stop and restart as the temperature rises and falls.

(6) Another protective circuit monitors the current drawn by antenna drive motor B801; it consists of two relays, K1C and K1D. When the current through either T3A and T3B or T1A and T1B exceeds 60 amperes, thermal elements OL1 and OL2 of either relay open and remove the common ground for relays K1, K2, K3, and K5. If the remote antenna rotate control is not set to stop, or if main power is not removed from the pedestal, the reduced voltage starter will attempt to recycle through its 10-second starting period and the antenna will rotate at 6 rpm when the overload relays cool off. If the high current is still present, the antenna will stop rotating. If the cause of high current is not corrected, the antenna will continue starting and stopping until fuse F801, F802, or F803 opens and removes the three-phase power from the reduced voltage starter.

(7) While F1 is intact, the neon indicator lamp remains extinguished. Should F1 open, the neon indicator, in series with a dropping resistor to 120 volts, would light.

e. Air pressure switch S805 (fig. 9–5) senses the air pressure delivered to the antenna group from the parent radar set or by the dry-air cylinder. When the air pressure to the antenna group (fig. 8–16) is above 10.5 pounds, air pressure switch S805 closes and presents a 120-volt air pressure signal for use by the parent radar set. When the air pressure drops below 10.5 pounds, air pressure switch S805 opens and removes the 120-volt air pressure signal. Resistor R804 shunts the air pressure signal to reduce the effects of stray pickup currents.

6–11. Heating and Ventilating System

Figure 6–6 is a schematic diagram of the heating and lubricating system of the pedestal. Under low-temperature conditions, the heating and ventilating system functions to prevent the low temperatures from interfering with the normal operation of the pedestal. Thermal switch S810 (located in the distribution box) is a 10° operating thermostat that opens at 40° F. (4.4° C.) and closes at 30° F. (−1.1° C.). When the outside temperature drops below 30° F. (−1.1° C.), S810 closes, causing the coil of relay K807 to be energized. Relay K807 closes and applies power to heaters HR806, HR807, HR808, and HR809 in the unit heater, HR811 and HR812 in the oil sump, and HR815 and HR816 around the oil return line. The closing of relay K807 also applies power to unit heater blower motor B805. The power to the heaters and the blower is applied through fuses F804, F805, and F806 which furnish overcurrent protection for those parts and their wiring. These fuses are energized whether or not antenna drive motor contactor K801 is closed. Overtemperature switch S809 in the unit heater opens at a high limit of +200° F. (93.3° C.) to prevent damage and possible fire that could be caused by failure of the blower motor to operate while the heaters are energized. Heater thermostat S808 in the oil sump maintains the heaters energized until the oil in the sump is up to 130° F. (54.4° C.). Normally open thermal switch S806 (immersed in the speed-reducer lubricating oil) closes below −15° F. (−26.1° C.) and energizes heater HR810. Heater HR810 is immersed in the speed-reducer lubricating oil.

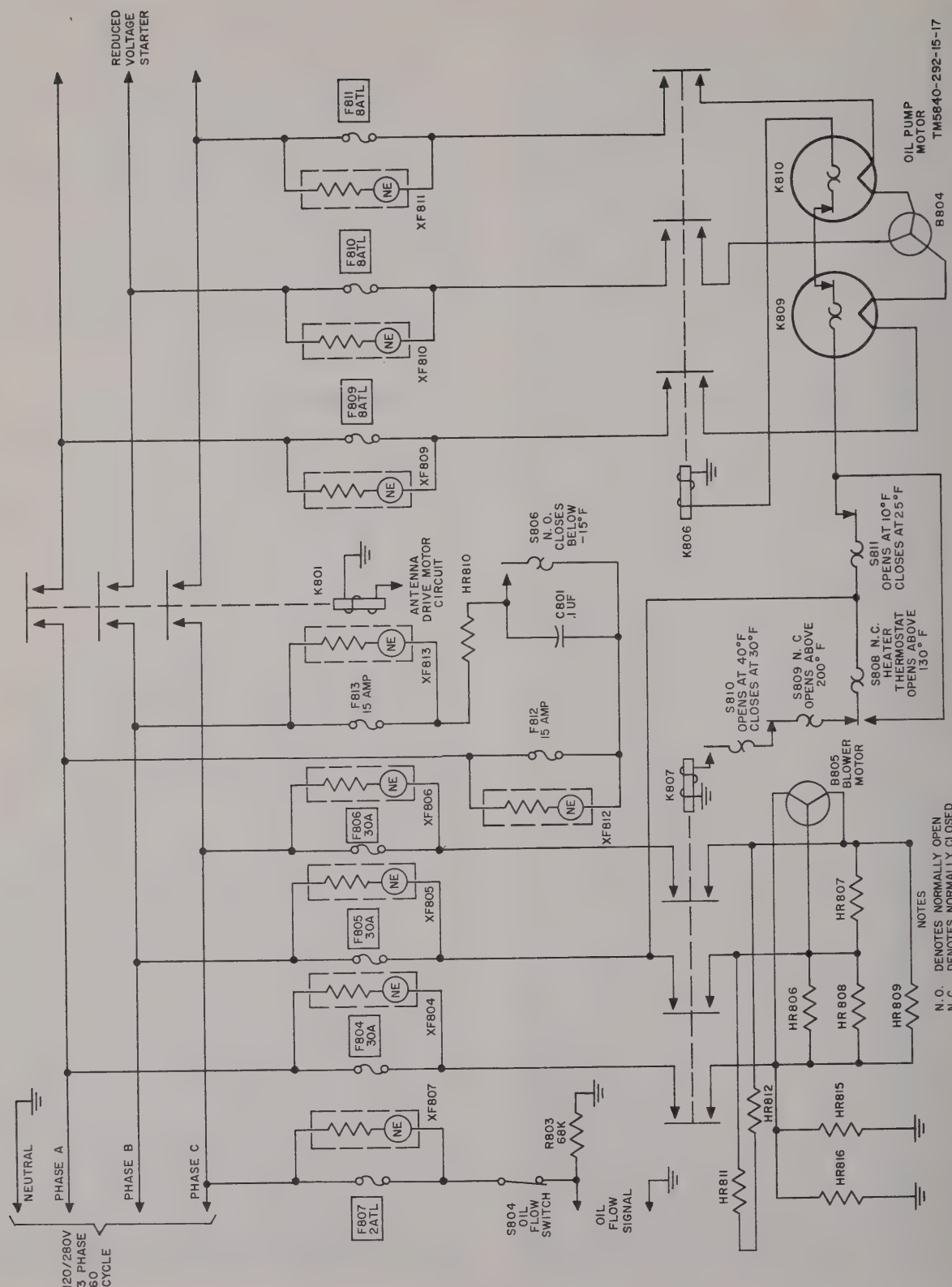


Figure 6-6. Heating and lubricating oil pump circuits, schematic diagram.

6–12. Lubricating Oil Pump Circuit
(fig. 6–6)

a. When antenna drive motor contactor K801 is closed (para 6–10), power is applied to lubricating oil pump motor B804 through fuses F809, F810, and F811, the contacts of relay K806, and thermal overload relays K809 and K810. The coil of relay K806 is activated through the contacts of K809 and K810 and thermostat switch S811. Thermostat switch S811, located on the oil drip pan assembly (fig. 2–16), opens at 10° F. (−12.2° C.) and closes at 25° F. (−3.9° C.) or higher; switch S811 closes and energizes relay K806 through overload protection relays K809 and K810. Power is thus applied to oil pump motor B804. The heaters of K809 and K810 are in series with the leads to B804, and are set to open the relays at 125 percent of B804 full load current; therefore, an overload on B804 caused by heavy oil would cause one or both of the overload relays, K809 and K810, to open and cut power off B804. These relays automatically reset in a short period of time and power is again applied to oil pump motor B804. During low-temperature operation, when the heating system has warmed the lubricating oil in the sump up to 130° F. (54.4° C.), S808 opens to shut off the heaters and closes to apply power to oil pump motor relay K806.

b. The following sequence of operation occurs when the antenna rotation is turned on under low-temperature (below 10° F. (−12.2° C.)) conditions. The heating system is energized when S810 is closed at temperatures below 30° F. (−1.1° C.). The antenna drive motor is energized and the antenna rotates. Since S811 on the drip pan is open (below 10° F. (−12.2° C.)), oil pump motor B804 will not run and the gears will be lubricated only with the residual oil remaining on their tooth surfaces. When the heating system warms the oil drip pan up to 25° F. (−3.9° C.), S811 is closed and oil pump motor B804 is started. If the oil in the sump is too heavy, an overload will exist on B804, causing K809 and K810 to cut off power to that motor. After a short period, K809 and K810 will reset and again start the oil pump motor. This process will continue repeatedly until the oil is sufficiently fluid to permit continuous running of the oil pump motor. Under severe conditions, when the heaters in the sump raise the temperature of the oil to above 130° F. (54.4° C.) before the drip pan is warmed up to 25° F. (−3.9° C.), S808 operates to apply power to the oil pump motor; and the warm oil is pumped up to the drip pan. The warm oil, thus circulated up to the drip pan, will assist in warming the drip pan to above 25° F. (−3.9° C.).

c. Switch S804 is an oil flow switch that opens when oil flows through the oil supply line. This switch operates a 120-volt oil flow signal for use by the parent radar set for monitoring the oil flow condition. When oil is flowing, the 120-volt oil flow signal is not present; when oil flow ceases, the 120-volt oil flow signal is present. Resistor R803 shunts the oil flow signal to reduce the effects of stray pickup currents.

6–13. Synchro System

Figure 6–7 is a schematic diagram of the synchro data system of the pedestal. The dashed lines indicate the portions of the circuit that are at the parent radar set and are shown in figure 6–7 so that the operation of the circuit can be explained and illustrated. Antenna positioning information is converted from mechanical data to electrical data and transmitted from the antenna group to the parent radar set. The information is converted by use of torque transmitters (TX) or torque receivers (TR).

a. Single-Speed Synchro. Synchro B802 is driven at the same speed as that of the antenna. Synchro excitation (115-volt, 60-cycle) from the parent radar set is applied to the rotor. Single-speed antenna position data are supplied to the parent radar set from the stator terminals of B802. Thus, the single-speed synchro system of the radar set can be made to follow the movements of the main antenna.

b. 24-Speed Synchro. Synchro B803 is geared to rotate 24 revolutions to 1 of the antenna. A mating synchro at the parent radar set, excited by the 400-cycle excitation voltage, is driven direct by B803 and rotates at 24 times the speed of the antenna. A one-speed switch system functions to lock the synchros to the correct multiple of 24. The single-speed switch system operates as follows:

(1) Switch S802 at the antenna group is open only when in contact with the cam. (This is electrical zero of B803.) Switch S1 at the parent radar set is closed only when in contact with its cam. Therefore, when the two single-speed cams are in synchronism and operate the switches simultaneously,

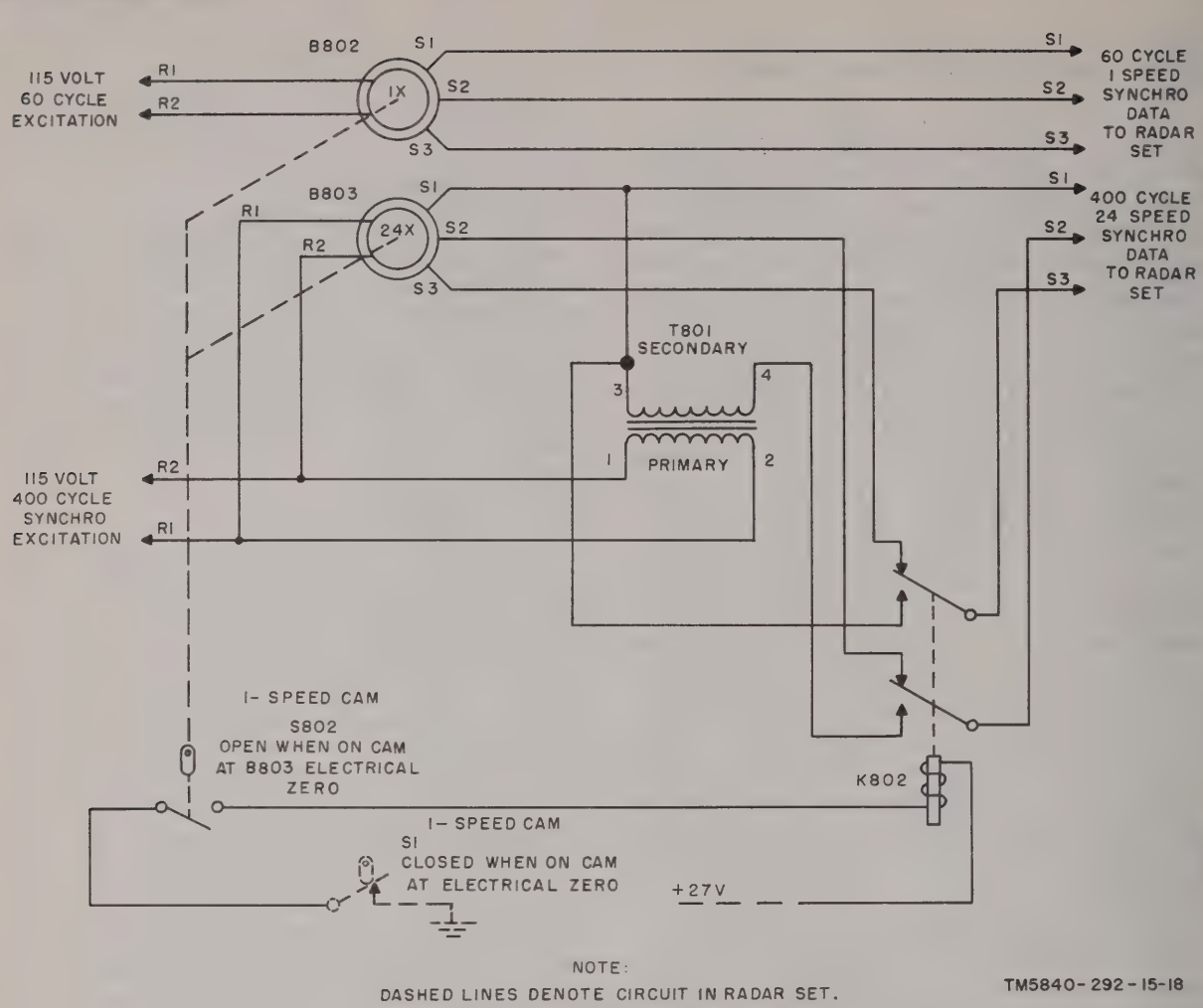


Figure 6-7. Synchro data system, schematic diagram.

either one or the other of the switches is always open.

(2) Since S802 and S1 are in series with the coil of relay K802, this relay is deenergized whenever synchronism exists. Deenergized K802 makes normal synchro connection between B803 and the 24-speed synchro at the parent radar set.

(3) When the two single-speed cams are not in synchronism, S802 will be closed when S1 closes at electrical zero of the parent radar set synchro. Under these conditions, relay K802 closes when the S1 cam is at electrical zero of the parent radar set synchro.

(4) Closing K802 disconnects S2 and S3 of B803 from the parent radar set mating synchro. The parent radar set synchro is connected for electrical zero with 78 volts ac from the secondary of T801 applied between S1–S3 and S2. This immediately stops the synchro and holds it at an electrical zero with S1 in a closed position. These conditions are maintained as the antenna continues to rotate until S802 is opened. At this time, relay K802 again drops out and restores normal synchro connections between B803 and the parent radar set synchro, and the single-speed cams are again in synchronism.

c. Synchro Data Transmission. Torque receivers and transmitters (synchros) are identical electrically (fig. 6-8). A synchro has three stator windings which are usually wye-connected and located 120°

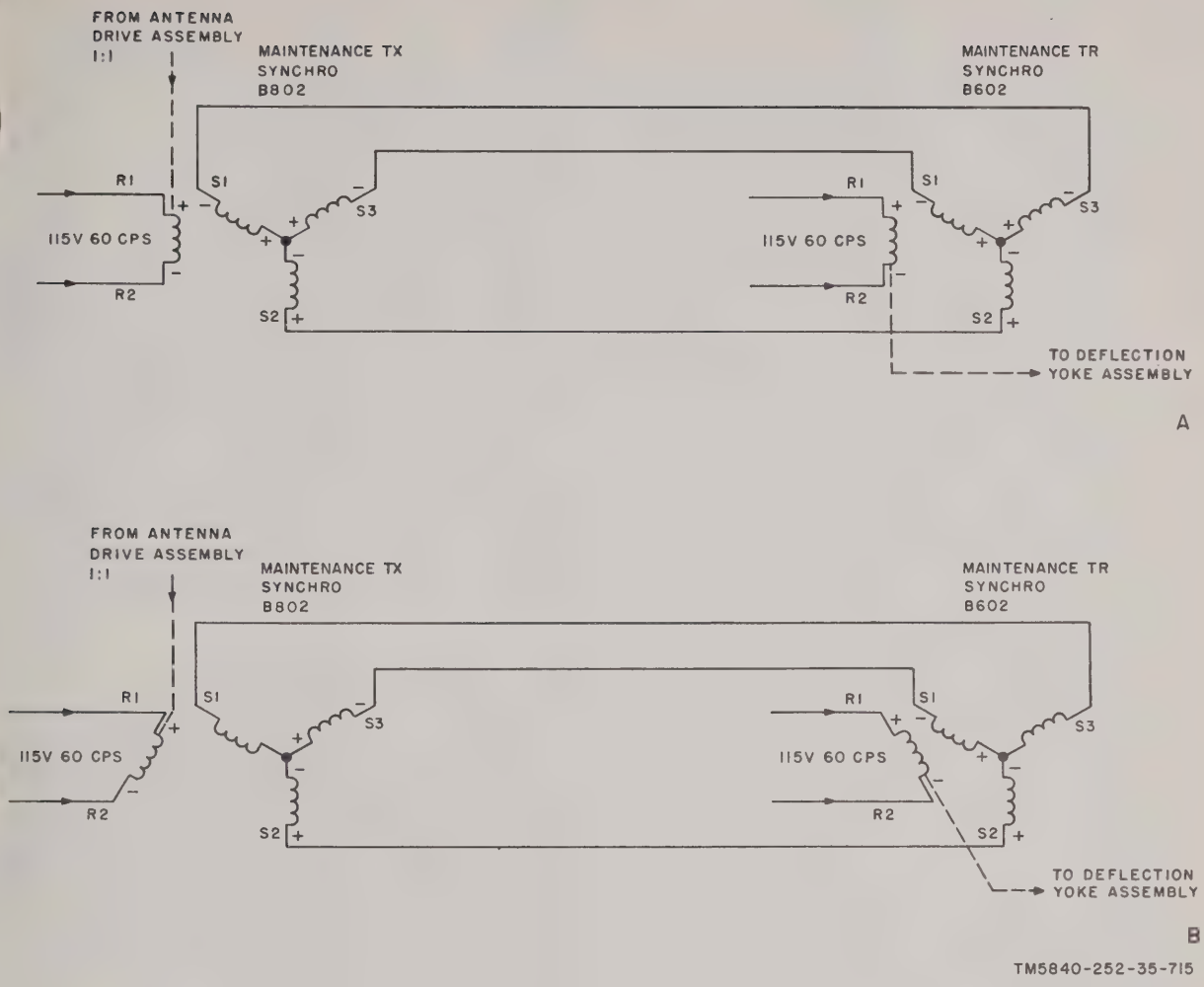


Figure 6-8. Synchro equivalent circuit.

apart. The rotor is a single winding that is the primary of a transformer. A typical application of synchro data transmitters and receivers is the transfer of antenna positioning information to the parent radar set. Applied to the rotor of B803 is 115 volts, 400 cycles. The stator windings have a voltage induced into them, the relative polarity and amplitude of which are determined by the instantaneous position of the rotor. When the rotor of B803 is in the position indicated in figure 6-8, it induces voltage into the stator windings. The stator windings of B803 are connected in parallel with B602 (in the local indicator), and the same voltages appear across them. Since the rotor of B602 also connects to the same 115-volt, 400-cycle source, the magnetic fields generated across the stators of B602 force the alignment of the rotor to be the same as that of the rotor of B803. Clockwise rotation of the B803 rotor (B, fig. 6-8) shows the voltages induced in S2 and S3, with no voltage induced in S1, since the coupling between the rotor and S1 is minimum. The S1 and S2 windings of B602 are connected in parallel with S3 and S2, respectively, of B803, and generate a magnetic field which causes the rotor to turn and align itself with the same magnetic field configuration as that generated in B803. The rotor of B602 rotates in a direction opposite to that of B803. This is necessary because of the gear reduction arrangement in the antenna pedestal and the yoke drive assembly, so that the resulting rotation of the antenna and deflection yoke are in the same direction.

6–14. Resolver Transmitter B825
(fig. 6–9)

a. Single-speed resolver transmitter B825 in the antenna pedestal furnishes antenna positioning data to the Improved Nike-Hercules Air Defense Guided Missile System. The rotor shaft of the resolver transmitter is mechanically connected to the main-antenna drive assembly through a gear train that has a ratio of 1:1. The resolver rotor rotates 1 revolution counterclockwise for each clockwise revolution of the main antenna.

b. The active stator winding, S1–S3, is energized by a 4-kc sinusoidal reference signal supplied by the Nike system. Terminals S2–S4 of the unused stator winding are connected together. This 4-kc reference signal has an amplitude of approximately 70 to 80 volts peak to peak as determined by adjustment made at the Nike system. The live side of the 4-kc reference signal input circuit is connected to terminal S3, and the common, or neutral, side is connected to terminals S1, S2, and S4. The 4-kc reference signal that is applied to the active stator winding is induced into rotor windings R1–R3 and R2–R4, which are oriented at right angles to each other. Because the rotor windings are at right angles to each other, the resultant output from one rotor winding will lead the other by 90°. Maximum transfer of signal occurs when a rotor winding is parallel with the active stator winding. Minimum transfer of signal occurs when a rotor winding is perpendicular to the active stator winding. Polarity (phase with respect to reference voltage) of the transferred signal from the stator to the rotor depends on the orientation of the rotor winding with respect to the stator winding. Assuming an instantaneous rotation angle of 0°, rotor winding R2–R4 is positioned for maximum positive signal transfer from the active stator winding, and rotor winding R1–R3 is positioned for minimum signal transfer from the active stator winding. Rotor windings, when moving from a position parallel to the active stator winding, provide a decreasing positive or negative voltage level; rotor windings, when moving from a position perpendicular to the active stator winding, provide an increasing positive or negative voltage level. For a rotation angle of 45°, the two rotor windings are positioned for equal positive-signal transfer. Rotor winding R2–R4 has a decreasing positive-signal transfer position with respect to the active stator winding, and rotor winding R1–R3 has an increasing positive-signal transfer position with respect to the active stator winding. For a rotation angle of 90°, rotor winding R1–R3 is positioned for maximum positive-signal transfer from the active stator winding, and rotor winding R2–R4 is positioned for minimum signal transfer from the active stator winding. As rotation continues beyond 90°, rotor winding R2–R4 moves from the minimum signal transfer position toward the maximum signal transfer position. However, the instantaneous polarity for rotor winding R2–R4 reverses and goes negative after passing the 90° rotation position. This reversal of polarity ocurs every 180° when the orientation of a rotor winding reverses in relation to the active stator winding. Thus the X-coordinate output related to rotor winding R2–R4 will lead the Y-coordinate output of rotor winding R1–R3 by 90°. The Y-coordinates are designated north-south data and the X-coordinates are designated east-west data.

6–15. Driver Amplifier A825
(fig. 9–13)

a. Driver amplifier A825 consists of two separate amplifier circuits, one for amplifying the resolver north-south data and the other for amplifying the resolver east-west data. The amplifier outputs drive the north-south and east-west antenna position data through cables to the Improved Nike-Hercules Air Defense Guided Missile System. The north-south data amplifier consists of V1 and V2 and is identical in design and operation with the east-west data amplifier consisting of V3 and V4.

b. The north-south data amplifier contains voltage amplifier V1, which drives power amplifier V2, and the east-west data amplifier contains voltage amplifier V3, which drives power amplifier V4. The north-south and east-west data amplifiers have individual floating grounds which are not connected to the chassis of driver amplifier A825. These two floating grounds (one for each amplifier) are connected together at terminals R3 and R4 of resolver transmitter B825, and connect to chassis ground via the cable harness within the electronic control amplifier box and plug P825 (fig. 9–11). The north-south rotor winding of resolver B825 connects to terminals 1 and 3 of plug P1 on driver amplifier A825, and the east-west rotor winding connects to terminals 2 and 4 of plug P1. When connected, these

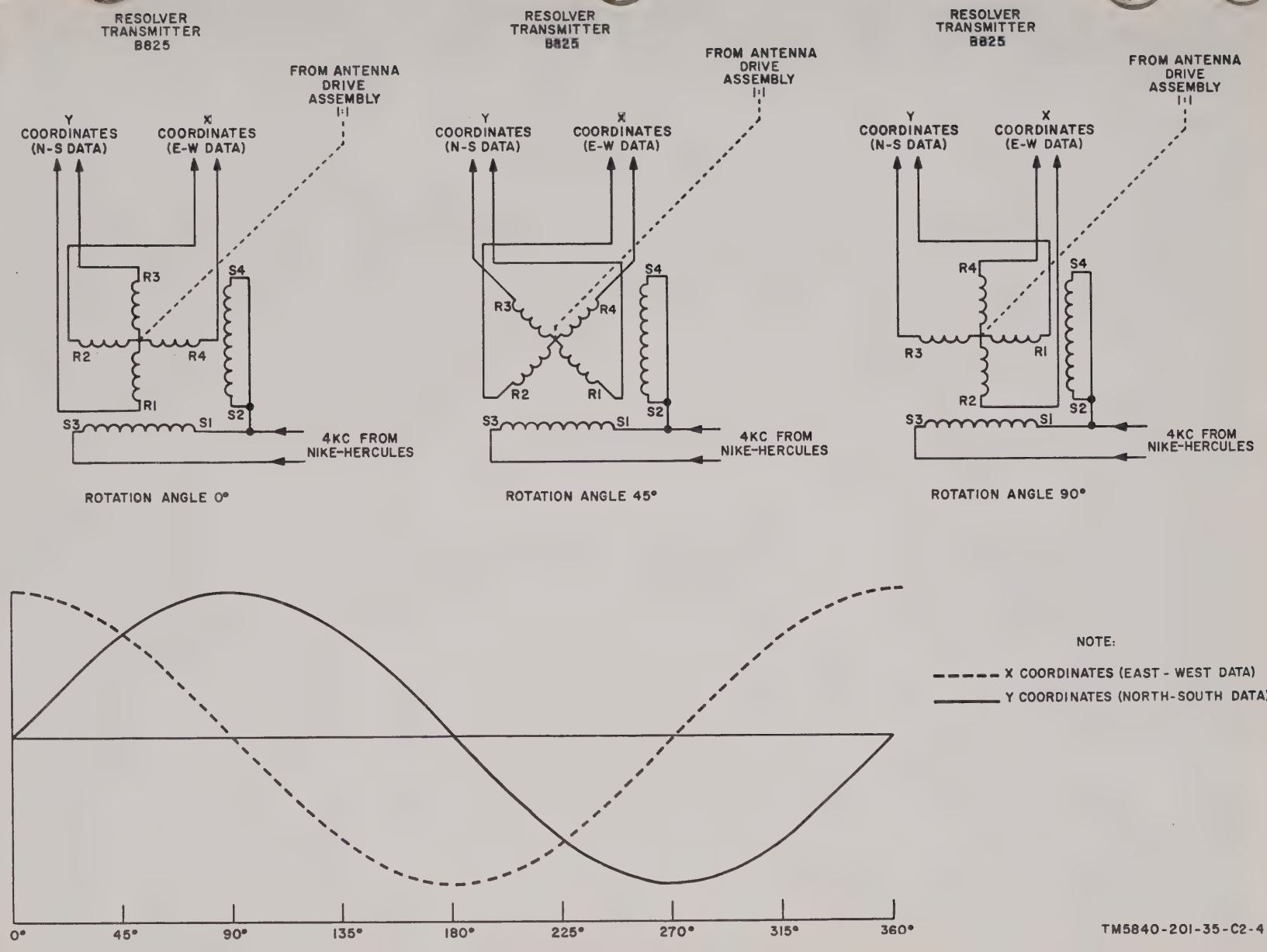


Figure 6–9. Resolver equipment circuit.

windings serve as return paths to ground as well as 4-kc north-south and east-west signal sources to drive the control grids of voltage amplifiers V1 and V3, respectively.

c. Each of the two data amplifiers that make up driver amplifier A825 contains conventional amplifier circuits, including a degenerative feedback circuit (between the secondary of the output impedance-matching transformer and the input to the voltage amplifier) that reduces distortion in the output signal. Driver amplifier A825 is identical with resolver amplifier 7620653 in the acquisition radar system of the Improved Nike-Hercules Air Defense Guided Missile System. Detailed theory coverage of this amplifier is contained in TM 9–1430–250–20/1.

6–16. Power Supply, +250-Volt (fig. 9–14)

The 115-volt, 400-cycle primary power obtained from the parent radar set is applied through F825 to the primary of transformer T1. The secondary of T1 provides filament power to tubes V1, V2, and V3 in the voltage regulator circuit and a stepped-up plate potential to the rectifier circuit of +250-volt power supply subassembly A826. The positive rectifier circuit consists of diodes CR1 through CR6, which operate as a full-wave rectifier. Three diodes are used on each side to increase the inverse breakdown voltage rating. The full-wave rectifier receives 740 volts ac from the high-voltage secondary of T1 and furnishes unregulated +370 volts to the +250-volt regulator circuit. The pulsating dc obtained from the output of the full-wave rectifier is applied to a resistance-capacitance (rc) filter network consisting of R14, R15, and C1, which smooths the ripple amplitude to an acceptable level. The filtering requirements are reduced because the output is applied to the voltage regulator circuit which provides further filtering of the ripple.

a. The regulator circuit maintains its output voltage virtually constant if a change occurs in the unregulated voltage applied to the regulator circuit or in the load drawn from the power supply. The unregulated dc voltage appears across C1 and is applied to the voltage regulator circuit. The dc plate resistance (R_p) of series regulator tubes V1 and V2 forms a voltage divider with R1 and R2 so that the voltage across the series regulators plus the voltage across R1 and R2 always equals the unregulated voltage across C1. The voltage regulator circuit maintains the voltage across R1 and R2 very close to +250 volts by controlling the voltage across the series regulators that vary their dc plate resistance.

b. Control tube V3 controls the bias on the series regulators, thus controlling their dc plate resistance. The cathode of control tube V3 is maintained at +100 volts (±5 percent) by Zener (breakdown) diode CR7 and resistor R4. Reverse-biased Zener diode CR7 (cathode positive with respect to anode) functions in a manner similar to that of some gas-filled tubes that start conducting (breakdown) at a particular voltage and continue to conduct varying amounts of current while the voltage of the tube remains approximately constant. Resistor R4 is a current-limiting resistor for CR7. Voltage divider R5 and R7 establishes the screen-grid potential of V3 with reference to the cathode potential.

c. The amount of conduction of V3 depends primarily on the potential at the control grid of V3 with respect to the fixed cathode potential (+100 volts ±5 percent). This bias potential is established by the voltage divider action of potentiometer R1 and resistor R2. Potentiometer R1 is adjusted to provide an output voltage of +250 volts. The plate current through V3 flows through plate load resistor R6 and causes the plate potential of V3 and the control grids of V1 and V2 to vary with respect to their cathodes. The difference in bias potential between the control grid and cathode of V3 controls the dc plate resistance of the series-regulator tubes and the regulated output voltage. If this output voltage starts to rise or fall, the change in voltage is felt at the control grid of the control tube, resulting in correction of the abnormal voltage.

d. Resistors R10 and R13 in the control grid circuits of V1 and V2 reduce the possibility of oscillations between the two tubes. Resistors R8, R9, R11, and R12 also serve as isolation resistors to reduce the possibility of oscillation. Capacitors C2 and C3 are screen filter capacitors. Capacitor C4, between the output and the control grid of V3, decreases the ripple amplitude of the output voltage by increasing the response of the circuit. Additional filtering is provided by capacitor C5.

e. The 3-ampere fuse, F825 (fig. 9–11), protects the primary of filament transformer 6A825T1 (fig. 9–13) and the primary of combination filament and plate transformer 6A826T1 (fig. 9–14). This fuse-

holder is a blown-fuse-indicator type and glows when the fuse is blown.

6–17. Miscellaneous Circuits

Figure 9–11 is a complete schematic diagram of the electrical wiring contained within the pedestal. The operation of the miscellaneous circuits that have not been discussed in the preceding paragraphs is given below.

a. Slipring. Four sliprings, E810, E811, E812, and E813, are contained in the pedestal. These sliprings are connected to terminal board TB803 in the pedestal base. They are not used directly in the operation of the antenna group, but are installed and wired for possible future use for warning lighting or other circuits.

b. Convenience Outlets. Two 120-volt, 60-cycle convenience outlets are provided for use with test equipment, extension lights, or other equipment. Fuse F808 (10 amperes) provides overcurrent protection for the receptacles and the equipment connected to them. Resistor R801 is connected in shunt with these receptacles to reduce the effects of stray pickup voltages.

CHAPTER 7

TROUBLESHOOTING AND REPAIR

Section I. GENERAL INFORMATION

7–1. General

This chapter provides information for the systematic troubleshooting and repair of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71. These instructions supplement the organizational troubleshooting instructions given in paragraphs 5–11 through 5–14. Systematic troubleshooting procedures begin with the operational checks at the organizational level and continue as necessary through the troubleshooting techniques described in this chapter.

7–2. Troubleshooting Procedure

a. When troubleshooting in the antenna group, the first objective is to determine whether the fault lies in the parent radar set, the interconnecting cables, or the 40-foot antenna itself. For example, failure of the parent radar set ppi indicator sweep to rotate may indicate a fault in the parent radar set or the interconnecting cables; or the trouble may be caused by failure of the antenna to rotate or by a fault in the synchro data system of the antenna group. Normal rotation of the 40-foot antenna with regard to speed, direction, and smoothness can be determined by observation.

b. Careful observation of symptoms may determine abnormal operation in the drive motor control, the heating and ventilating system, the lubricating oil system, the antenna positioning system, or other parts.

Warning: **When troubleshooting, treat all components and areas with the understanding that they may contain unknown voltages. When a malfunction occurs, fatal voltage can appear in the least expected places.**

Section II. TROUBLESHOOTING IN ANTENNA GROUPS OA–4040/FPS–69 AND OA–6957/FPS–71

7–3. Reference Data

The following reference data in the manual should be helpful in performing corrective maintenance on the antenna group.

a. Figure 9–4. Functional block diagram of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71.

b. Figure 9–6. Terminal board voltage and resistance measurements.

c. Figure 9–7. Driver amplifier 6A825, voltage and resistance measurements at tube sockets.

d. Figure 9–8. Power supply 6A826, voltage and resistance measurements at tube sockets.

e. Figure 9–11. Antenna pedestal complete schematic diagram.

f. Figure 9–12. Reduced voltage starter, unit No. 13, complete schematic diagram.

g. Figure 9–13. Driver amplifier 6A825, complete schematic diagram.

h. Figure 9–14. Power supply 6A826, complete schematic diagram.

7–4. Fuses

The ratings, locations, and functions of all fuses used in the antenna group are listed in paragraph 2–13. Each fuse is equipped with a blown-fuse indicator which glows when the fuse is blown.

Caution: **Always replace a blown fuse with one that has the same rating. If a replacement fuse blows, a malfunction exists that must be corrected before the fuse is again replaced.**

7–5. Test Equipment Required

The following items of test equipment are required to maintain Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71. The test equipment listed is available through the parent radar set site.

Test equipment	Common name	Reference	Use
Multimeter, TS–352/U or AN/URM–105.	Multimeter	TM 11-5527 or TM 11–6625–203–12.	To make voltage and resistance measurements.
Multimeter ME–26B/U	Vtvm	TM 11–6625–200–12.	To make voltage and resistance measurements of high-impedance circuits.
Test Set, Electronic Tube TV–7D/U.	Tube tester	TM 11–6625–274–12.	To check tubes.
Oscilloscope AN/USM–81.	Oscilloscope	TM 11–6625–219–12.	To observe waveforms.
Adapter Kit, Tube Socket MX–1258/U.	Tube socket adapter kit	Literature packed with tube socket adapter kit.	To provide a means for making tube socket measurements conveniently on the top of the chassis.

7–6. Troubleshooting Information

a. Before troubleshooting in the pedestal, check the remote antenna rotate control and the applicable warning and indicator lamps at the parent radar set (operated by air pressure signal, oil flow signal, and antenna rotate signal). The antenna group makes available to the parent radar set certain signals for monitoring various functions within the pedestal. These monitoring signals, when used by the parent radar set, may be displayed in the form of indicator lamps or for actuating interlock circuits. Consult the parent radar set manuals for circuit use and symptom interpretation.

b. Additional damage will be caused if power is applied to equipment in which a complete or partial short circuit exists. Check for short circuit before applying power to the equipment when any of the following conditions apply:

(1) A replaced fuse has blown.
(2) Smoke is observed coming from a component.
(3) Overheating parts are observed or smelled.
(4) A defective component is being serviced apart from other components of the antenna group and the nature of the trouble is not known.
(5) Abnormal symptoms reported from operational tests indicate the possibility of partial or complete short circuits.

c. Check all blown-fuse indicators early in the troubleshooting procedure and be sure that cables are properly connected and not damaged.

d. Operation of the motor contractor, reduced voltage starter, and associated relays can be checked visually or by listening for the audible click when they are pulled in. Open relay coils and faulty wiring usually can be detected by checks of the resistance to ground at the terminal boards and comparisons of the readings taken with those given in figure 9–6. Point-to-point continuity checks taken with an ohmmeter and reference to the schematic diagram (fig. 9–11) are useful for locating faults in the pedestal circuitry.

e. Proper and efficient operation of the rf system of the antenna group is best determined by observation of the reverse power monitor at the parent radar set. This device continually monitors the rf system and removes power when an abnormal condition exists. An abnormal condition of the rf system may indicate a damaged waveguide, rotary coupler, or antenna horn, or the presence of moisture in the system.

f. A malfunction of the resolver antenna positioning data can be bracketed to resolver B825, driver amplifier A825, or the +250-volt power supply. Voltage and resistance measurements for driver amplifier A825 are shown in figure 9–7, and voltage and resistance measurements for the +250-volt power supply are shown in figure 9–8.

7–7. Troubleshooting Chart

Symptom	Probable cause	Procedure
1. Antenna fails to rotate when remote antenna rotate control is set to run position.	Fused line switch (not supplied) not turned on.	Throw fused line switch on (para 5–14).
	Safety ON-OFF switch S801 at OFF---	Make certain that everything is clear of antenna, and throw S801 to ON. ***Warning:*** **Observe microwave radiation hazard listed in parent radar set manual.**
	Blown fuse F801, F802, F803, or F807--	Check fuses (fig. 7–1). Replace if necessary.
	Controls at parent radar set improperly positioned.	Refer to parent radar set manual and recheck control settings.
	Damaged or improperly connected power input cable W80 or control cable W81.	Check cables and cable terminations (figs. 2–10–2–13).
	Faulty motor contactor K801---------	Check K801 (fig. 7–1), and clean contactors or replace if necessary.
	Absence of 120/208-volt, 60-cycle power in reduced voltage starter.	Using multimeter, measure for 120 volts ac between following terminals on 13TB1: T3 to T0, T2 to T0, T1 to T0 (fig. 7–2).
	Defective fuse 13F1----------	Check blown-fuse indicator 13XF1. If illuminated, replace fuse 13F1.
	Control relay 13K5, reduced voltage start relay 13K1A, or line voltage relay 13K1B.	During first 10 seconds after motor contactor K801 has been energized, relay 13K5 should be deenergized and continuity should exist between terminals 3 and 4. Relay 13K1B should be deenergized, and continuity should exist between terminals LB1 and LB2. Using multimeter, measure for 120 volts ac between terminals 1 and 4 of relay 13K1A. Using multimeter, measure 120 volts ac between terminals T3 of TB1 and L3 of relay 13K1A, and between terminals T1 of 13TB1 and L1 of relay 13K1A. Check overload relays 13K1C and 13K1D, along with normally closed contacts (3 and 4) of autotransformer overtemperature relay 13K4. Refer to paragraph 6–10*d*.
	Reduced voltage start relay 13K2 inoperative.	Using multimeter, measure 120 volts ac between terminals 1 and 4 of relay 13K2. Relay 13K2 should be energized and measure 78 volts ac between terminals T0 on 13TB1 and L3 of 13K2, T0 on 13TB1 and L2 of 13K2, and T0 on 13TB1 and L1 of 13K2. Refer to paragraph 6–10*d*.
	Open heat element in overload relay 13K1C or 13K1D.	Check continuity between terminals 0L1 and 0L2 on overload relays 13K1C and 13K1D. Replace defective overload relay.

Symptom	Probable cause	Procedure
2. Antenna rotates at less than 6 rpm after 10 seconds.	Damaged or faulty motor B801	Repair or replace motor B801 (fig. 7–3).
	10-second time delay relay 13K3	Connect multimeter for measuring 120 volts ac between terminals 1 and 2 on control relay 13K5. Ten seconds after motor contactor K801 closes, control relay 13K5 should be energized. Replace faulty 10-second time delay relay 13K3 or control relay 13K5.
	Line voltage relay 13K1B	Measure 120 volts ac between terminals 1 and 2 on line voltage relay 13K1B. Measure 120 volts ac between following terminals: T0 of 13TB1 and T3 of 13K1B, T0 of 13TB1 and T2 of 13K1B, and T0 of 13TB1 and T1 of 13K1B. Replace faulty relay.
	Below —15° F. (—26° C.) thermostat switch S806, heater HR810, or faulty wiring (fig. 7–5).	Thermostat switch S806 closes below —15° F. (—26° C.). With power off, check for continuity between terminals X8J and X7K on terminal board TB808, and between terminals X7K and X7J on terminal board TB808. Replace faulty component. Check wiring in accordance with schematic diagram (fig. 9–11).
3. Antenna rotates at 6 rpm, and then stops, it later recycles through 10-second start to normal 6 rpm.	Overload relay 13K1C or 13K1D	Check across overload thermal contacts (0L1 and 0L2) of overload relays 13K1C and 13K1D with multimeter when antenna stops rotating. Ac voltage reading across either set of thermal contacts indicates excessive current or faulty overload relay. Replace faulty overload relay or faulty motor B801, or investigate cause of excessive motor drive load.
	Overheated tapped autotransformer 13T1.	Check temperature of tapped autotransformer for excessive heating (302° F., 150° C.). Replace tapped autotransformer if defective.
4. Antenna starts rotating without cycling through 10-second reduced voltage start period.	Check 10-second time delay relay 13K3	See that 120 volts ac is applied to terminals 1 and 2 of control relay 13K5 10 seconds after motor contactor K801 is actuated. Replace 10-second time delay relay 13K3. Failure to obtain 120 volts ac across terminals 1 and 2 of control relay 13K5 indicates line voltage relay 13K1B is stuck in energized position. Replace line voltage relay 13K1B.
	Check control relay 13K5	See that 120 volts ac is applied to terminals 1 and 2 of line voltage relay 13K1B 10 seconds after motor contactor K801 is actuated. If control relay 13K5 is stuck in energized position, 120 volts ac will be applied immediately to energizing coil of line voltage relay 13K1B. Replace control relay 13K5.

Symptom	Probable cause	Procedure
5. Antenna rotates in wrong direction, from north to west to south, etc (counterclockwise).	Improper phase connections at fused line switch (not supplied).	Reverse connections of any two of three hot conductors of power input cable W80 at load terminals of fused line switch.
6. Heater blower motor B805 (part of Z815) fails to operate when fused line switch is placed in ON position with outside temperature below 30° F. (—1.1° C.).	Blown fuses F804, F805, and F806	Check fuses and replace if necessary.
	Relay K807	Check relay and replace if necessary.
	Faulty thermostat switch S808, S809, or S810.	Check for closed thermostat switches S808, S809, and S810. Replace faulty thermostat switch.
	Faulty wiring	Check wiring (fig. 9–11).
	Damaged or faulty blower motor B805 (in unit heater Z815).	Repair or replace blower motor B805.
7. Lubricating oil pump motor B804 fails to operate when remote antenna rotate control is set to run. Temperature adjacent to thermostat switch S811 above 10° F. (—12.2° C.).	Blown fuses F809, F810, and F811	Check fuses and replace if necessary.
	Relay K806 (fig. 7–1)	Check relay K806 and replace if necessary.
	Open thermo-interlock switch S811 opens at 10° F. (—12.2° C.) and closes at 25° F. (—4° C.).	Check thermo-interlock switch S811 in relation to opening and closing temperatures. Replace faulty switch (fig. 9–11).
Caution: **Do not leave antenna rotating when lubrication pump is not running. Damage to equipment may result. Refer to paragraph 3–3.**	Faulty thermal overload relays K809 and K810.	If operating at low temperatures, turn off antenna rotation and wait until heater has caused oil temperature to rise (para 3–3). If operating under normal temperature, check S811, K809, or K810 and replace if necessary.
	Faulty wiring	Check wiring (fig. 9–11).
	Faulty oil pump motor B804	Repair or replace oil pump motor B804.
8. Lubricating oil pump motor B804 operates when remote antenna rotate control is set to run. Temperature adjacent to thermostat switch S811 is below 10°F. (—12.2° C.).	Faulty thermostat switch S811. See switch temperature range above.	Switch S811 should be open below 10° F. (—12.2° C.). Replace switch if faulty.
	Faulty heater thermostat switch S808. Motor operating contacts of switch should not close until the temperature is above 130°F. (54° C.).	Switch S808 should be open below 130° F. (54° C.). Replace switch if faulty.
Caution: **Do not operate antenna unless lubricating oil pump is running. Damage to equipment may result.**		
9. Unit heater Z815 is not operating when temperature is below 30°F. (—1.1° C.).	See symptom 6 above	Refer to symptom 6 above.
	Damaged or faulty heating units in unit heater.	Check HR806, HR807, HR808, and HR809; replace faulty heating unit.
	Faulty wiring	Check wiring (fig. 9–11).
10. Antenna rotates normally but ppi sweep at parent radar set does not rotate. Refer to parent radar set manual.	No synchro excitation voltage from parent radar set.	Check for synchro rotor voltage at proper terminal board points. Refer to schematic diagram (fig. 9–11).
	Faulty cable or connections	Check cables and cable terminations.
	Faulty synchro B802 or B803 (fig. 2–18)	Check synchros; replace if necessary.
	Fault in parent radar set synchro system.	Refer to parent radar set manual.
11. Antenna rotates normally but sweep rotates in opposite direction.	Synchro leads mixed	Check synchro connections.
12. Ppi sweep at parent radar set driven by 24-speed synchro does not remain in synchronism with antenna.	Synchro switch S802 (fig. 2–16) open circuited.	Check S802 and associated wiring.
	Faulty transformer T801 (fig. 7–1)	Check for 78 volts across terminals 3 and 4 of T801.
	Faulty relay K802 (fig. 7–1)	Check relay K802 and replace if necessary.

Symptom	Probable cause	Procedure
	Loss of energizing voltage for relay K802.	Refer to parent radar set manual and schematic diagram (fig. 9–11).
13. Ppi sweep at radar set driven by 24-speed synchro remains at electrical zero and does not follow antenna movements.	Cam is not opening synchro switch S802 (fig. 2–16).	Check operation of cam and S802.
14. Parent radar set indicates open antenna rotation interlock circuit.	Faulty relays K803, K804, and K805	Check for 120 volts ac between terminals 01 and 20F on terminal board TB801. Check for 120 volts ac between terminal 01 (neutral) on terminal board TB801 and pin 3 of relay K805 and pin 3 of relay K804.
15. Nike indicates weak or no antenna azimuth position data present (N-S and E-W data).	115-volt, 400-cycle power from parent radar set not present.	Using multimeter, measure for 115 volts ac between terminals 98 and 99 on terminal board TB804. If voltage is either incorrect or absent, check parent radar set.
	4-kilocycle reference voltage from Nike system not present.	Connect oscilloscope across pins 18 and 31 of jack J826 and check for 4-kilocycle sinusoidal reference voltage (approx 70 to 80 volts peak to peak). If no signal is displayed on oscilloscope, check parent radar set.
	Defective fuse F825	Check for illumination of blown-fuse indicator F825 in resolver amplifier. Replace fuse if indicator is illuminated.
	Filament transformer A825T1 or internal wiring.	Measure between terminals 1 and 2 of A825T1 for 115 volts, 400 cycles. If voltage is obtained, observe that tubes A825V1 through A825V4 in resolver amplifier are lighted. If tubes are not lighted, measure for 6.3 volts ac between terminals 3 and 5 and between 6 and 8 of A825T1. If no voltage is obtained, check A825T1.
	+205-volt power supply A826	Measure between terminals 1 and 2 of A826TB1 for 115 volts, 400 cycles. If voltage is obtained, observe that tubes V1, V2, and V3 in power supply are lighted. If either tube V1 or V2 is not lighted, replace the tube. If neither V1 nor V2 is lighted, measure between terminals 8 and 10 of A826T1 for 6.3 volts ac. If tube V3 is not lighted, replace tube. If fault is not corrected, measure between terminals 11 and 13 of A826T1 for 6.3 volts ac. If all tubes are lighted, measure between terminals 3 and 5 (ground) of A826TB1 for +250 volts dc ±3. If no voltage is obtained, check tubes A826V1, A826V2, and A826V3, diode rectifiers A826CR1 through A826CR6, voltage reference diode A826CR7, and transformer A826T1. Make voltage

Symptom	Probable cause	Procedure
		and resistance measurements at tube bases (fig. 9–8). If voltage is obtained but is incorrect, adjust A826R1 for +250 volts dc (para 2–11*a*).
		If no voltage is obtained at terminals 1 and 2 of A826TB1, check wiring between A826TB1 and terminals 98 and 99 on terminal board TB804 for continuity (fig. 7–1).
	Resolver B825 or interconnections between B825 and J826.	Using oscilloscope, check for presence of 4-kilocycle reference signal (approx 70 to 80 volts peak to peak) at terminals S3 and S4 (reference ground) on resolver B825.
		If signal is present, check for presence of 4-kilocycle resolver output signals at terminals R1 and R3 (ground) and at terminals R2 and R4 (ground) on resolver B825. If signals are not present at output, check resolver.
		If 4-kilocycle reference signal is not obtained at S3 and S4 of B825, disconnect cable connector of cable 8171827 from jack J826 and check for continuity from resolver to pin connections on jack J826 while referring to schematic diagram (fig. 9–11). If continuity is indicated, check parent radar set.
16. Nike personnel indicate improper antenna azimuth position data (Nike ppi sweep not properly oriented with respect to radar antenna).	Resolver B825 not adjusted properly---	Adjust resolver B825 in antenna pedestal (para 2–11*b*).
17. Nike indicates weak or no N-S position data present (E-W data normal).	Defective resolver B825----------	Using oscilloscope, check for presence of the 4-kilocycle resolver output signals at terminals R1 and R3 (ground) and at terminals R2 and R4 (ground) on resolver B825. If signal amplitude which depends on position of resolver rotor is obtained at terminals R2 and R4 but not at R1 and R3, resolver is defective.
	Defective N-S resolver amplifier (A825V1 and A825V2).	Check A825V1, A825V2, and A825T2. Make voltage and resistance measurements at tube bases (fig. 9–7).
	Open connections between N-S resolver amplifier and Nike system.	Check between following points for continuity: pin 5 of P825 and pin 25 of J826, pin 7 of P825 and pin 10 of J826. Notify parent radar set personnel.
18. Nike indicates weak or no E-W position data present (N-S data normal).	Defective resolver B825----------	Using oscilloscope, check for presence of 4-kilocycle resolver output signals at terminals R2 and R4 (ground) and at terminals R1 and R3 (ground) on resolver B825. If signal (amplitude of which depends on position of

Symptom	Probable cause	Procedure
		resolver rotor) is obtained at terminals R1 and R3 but not at R2 and R4, resolver is defective.
	Defective E-W resolver amplifier (A825V3 and A825V4).	Check A825V3, A825V4, A825T12. Make voltage and resistance measurements at tube bases (fig. 9–7).
	Open connections between E-W resolver amplifier and Nike system.	Check between following points for continuity: pin 9 of P825 and pin 28 of J826; pin 11 of P825 and pin 14 of J826. Check parent radar set.
19. Nike indicates open antenna rotation interlock circuit.	Faulty relay K803, K804, or K805	Remove cable plug from J826 and check for continuity between pins 4 and 22 of jack J826 while antenna is rotating. Check for continuity between pins 6 and 7 of relays K803, K804, and K805 while antenna is rotating. Reconnect cable plug to jack J826.
	Interconnecting wiring	Check for continuity between pin 7 of relay K805 and pin 22 of J826, and pin 6 of relay K804 and pin 4 of J826. Check parent radar set.

7–8. Antenna Positioning System, Nike Integration Section, Step-by-Step Troubleshooting Chart

a. Power Supply 6A826 Step-by-Step Troubleshooting Chart.

Step	Test point	Test equipment	Controls	Normal indication	Corrective measures
1	Between terminals 8 and 10 of T1 (fig. 7–9).	Set multimeter to measure 6.3 vac.	Antenna safety switch S801 to OFF. Remote antenna rotate control to stop. Appropriate control to apply 115 volts, 400 cycles to antenna pedestal.	6.3 vac	Check T1.
2	Between terminals 5 and 7 of T1 (fig. 7–9).	Set multimeter to measure 740 vac.	Same as step 1	740 vac	Check T1.
3	Pin 1 of V1 or V2 and ground (fig. 7–9).	Set multimeter to measure +370 vdc.	Same as step 1	+370 vdc	Check C1, CR1 through CR6, R14, and R15.
4	Pin 7 of V3 and ground (fig. 7–9).	Set multimeter to measure +100 vdc.	Same as step 1	+100 vdc	Check CR7, R4, R5, and R7.
5	Between terminals 3 and 5 (ground) of TB1 (fig. 7–7).	Set multimeter to measure +250 vdc.	Same as step 1	+250 vdc	Adjust R1 (para 2–11*a*). Check V1, V2, V3, C4, and C5. Make voltage and resistance measurements at tube sockets (fig. 9–8).

b. Driver Amplifier 6A825 Step-by-Step Troubleshooting Chart.

Step	Test point	Test equipment	Controls	Normal indication	Corrective measures
1	Between terminals 1 and 3 (ground) of P1 (fig. 7–8).	Oscilloscope ---	Antenna safety switch S801 to OFF. Appropriate control to apply 115 volts, 400 cycles to antenna pedestal.	4-kilocycle N-S data signal. *Note.* Amplitude of this signal (approx 70 to 80 volts peak to peak maximum) depends on position of antenna.	Check P1 and connections to P1.
2	Between terminals 1 and 2 (ground) of T2 (fig. 7–8).	Oscilloscope ---	Same as step 1--------	4-kilocycle N-S data signal (approx 70 to 80 volts peak to peak maximum).	Check V1 and V2. Make voltage and resistance measurements at tube bases (fig. 9–7). Check T2.
3	Between terminals 2 and 4 (ground) of P1 (fig. 7–8).	Oscilloscope ---	Same as step 1--------	4-kilocycle E-S data signal. *Note.* Amplitude of this signal (approx 70 to 80 volts peak to peak maximum) depends on position of antenna.	Check P1 and connections to P1.
4	Between terminals 1 and 2 (ground) of T12 (fig. 7–8).	Oscilloscope ---	Same as step 1--------	4-kilocycle E-W data signal (approx 70 to 80 volts peak to peak maximum).	Check V3 and V4. Make voltage and resistance measurements at tube bases (fig. 9–7). Check T12.

7–9. Removal and Replacement of Parts in Resolver Amplifier

a. To gain access to the subassemblies located in the resolver amplifier, proceed as follows:

(1) Loosen the four slotted screws that secure the sunshade to the resolver amplifier brackets, and remove the sunshade.
(2) Loosen and disengage the eight slotted captive screws that secure the cover to the resolver amplifier.
(3) Loosen the two knurled captive screws that secure the hinged shelf to the resolver amplifier.
(4) Clear the cable harness and swing the hinged shelf open, exposing the underside of driver amplifier 6A825 and +250-volt power supply 6A826.

b. To remove the +250-volt power supply from the hinged shelf, proceed as follows:

(1) Disconnect the four leads at terminals 1, 2, 3, and 5 of 6A826TB1. Label each lead as it is removed.
(2) Remove the four screws that secure the +250-volt power supply to the hinged shelf.

c. To remove the driver amplifier from the hinged shelf, proceed as follows:

(1) Disconnect 6P825 from 6A825P1.
(2) Remove the four screws that secure the driver amplifier to the hinged shelf.

d. To replace the driver amplifier on the hinged shelf, proceed as follows:

(1) Orient the driver amplifier chassis so that the 6A825P1 connection is on top and, with the original four screws, fasten the driver amplifier to the front side of the hinged shelf.
(2) Connect 6P825 to 6A825P1.

e. To replace the +250-volt power supply on the hinged shelf, proceed as follows:

(1) Orient the +250-volt power supply so that power transformer 6A826T1 is toward the bottom, and fasten it to the front side of the hinged shelf, with the original four screws.
(2) Connect the four leads to their respective terminals on 6A826TB1.

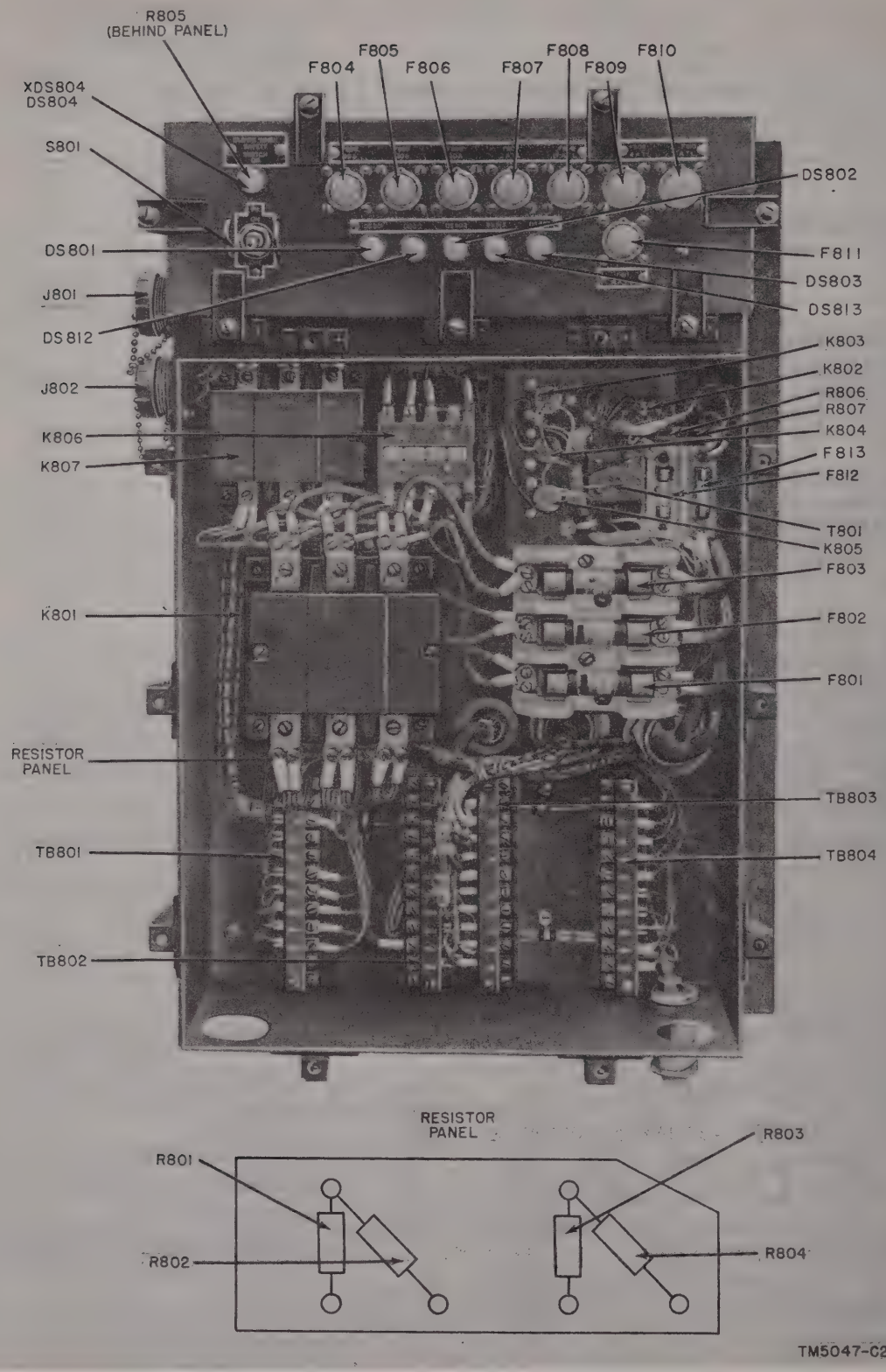


Figure 7-1. Distribution box, detailed parts.

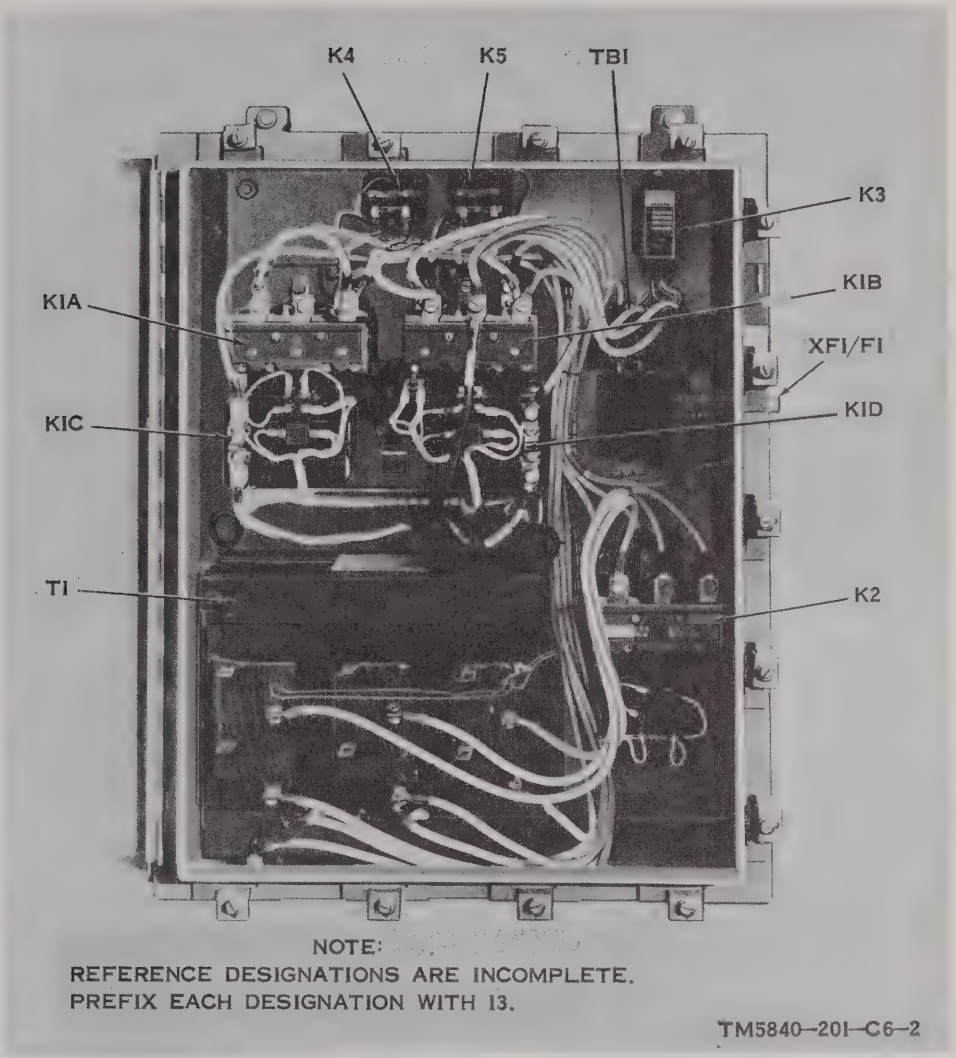


Figure 7–2. Reduced voltage starter unit No. 13, top view.

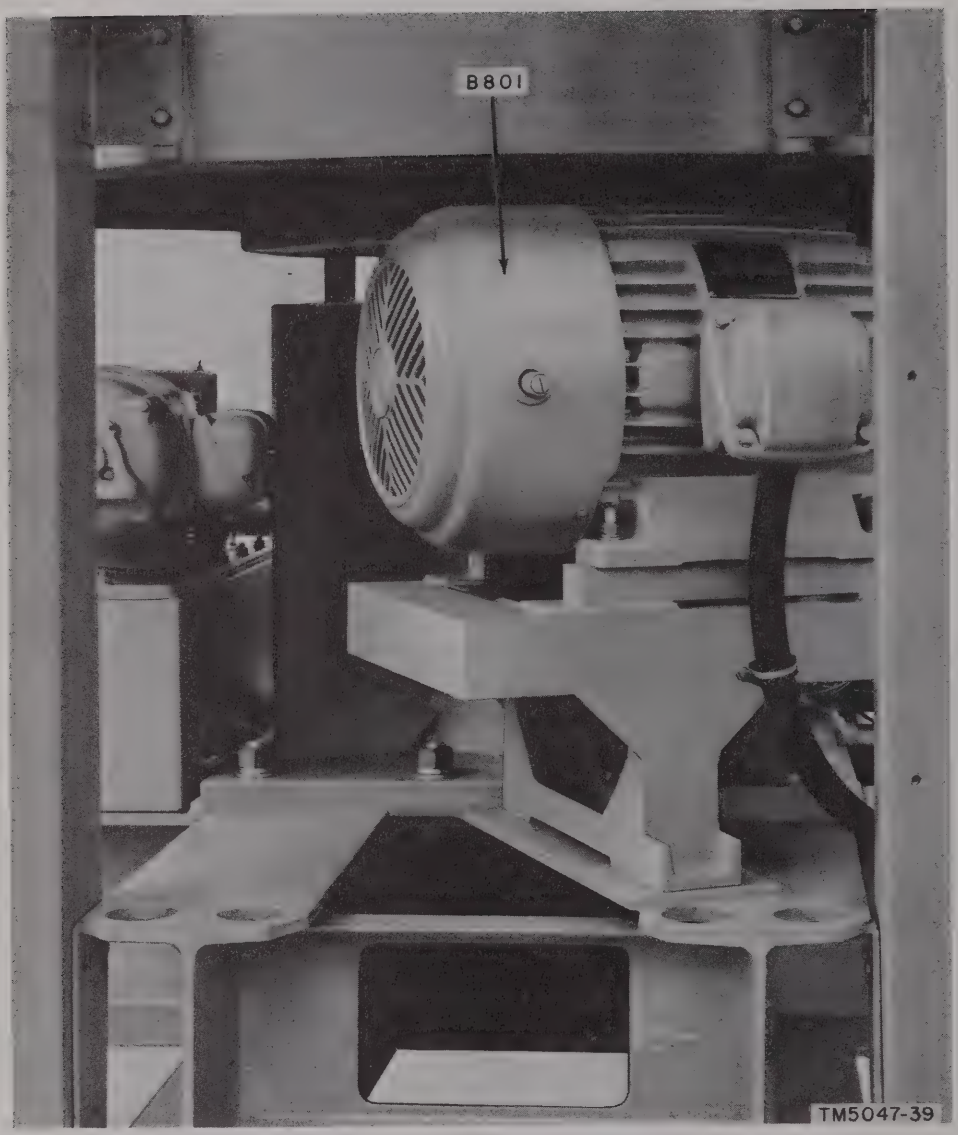


Figure 7–3. Antenna drive motor B801.

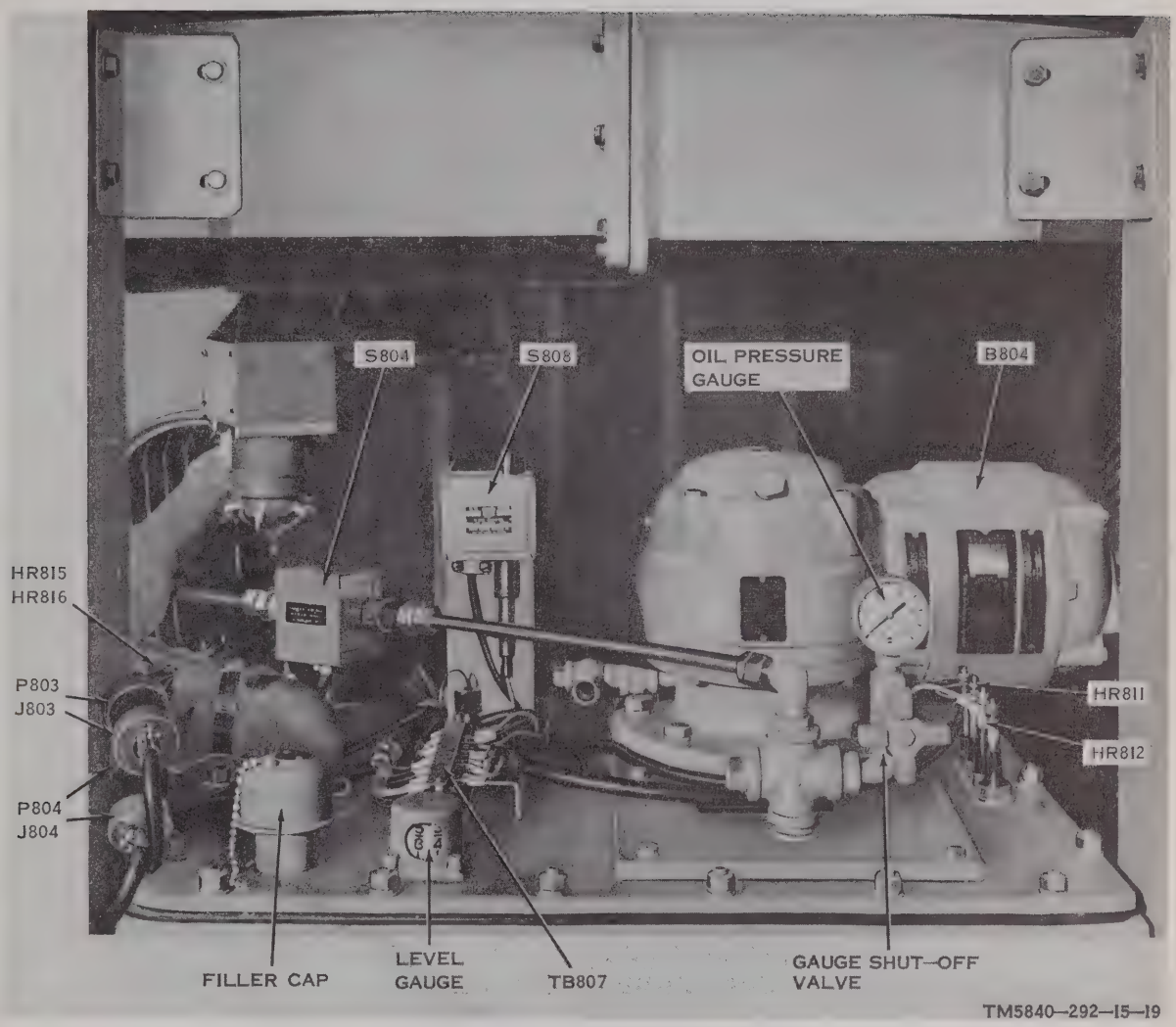


Figure 7-4. Lubricating oil sump, detailed parts.

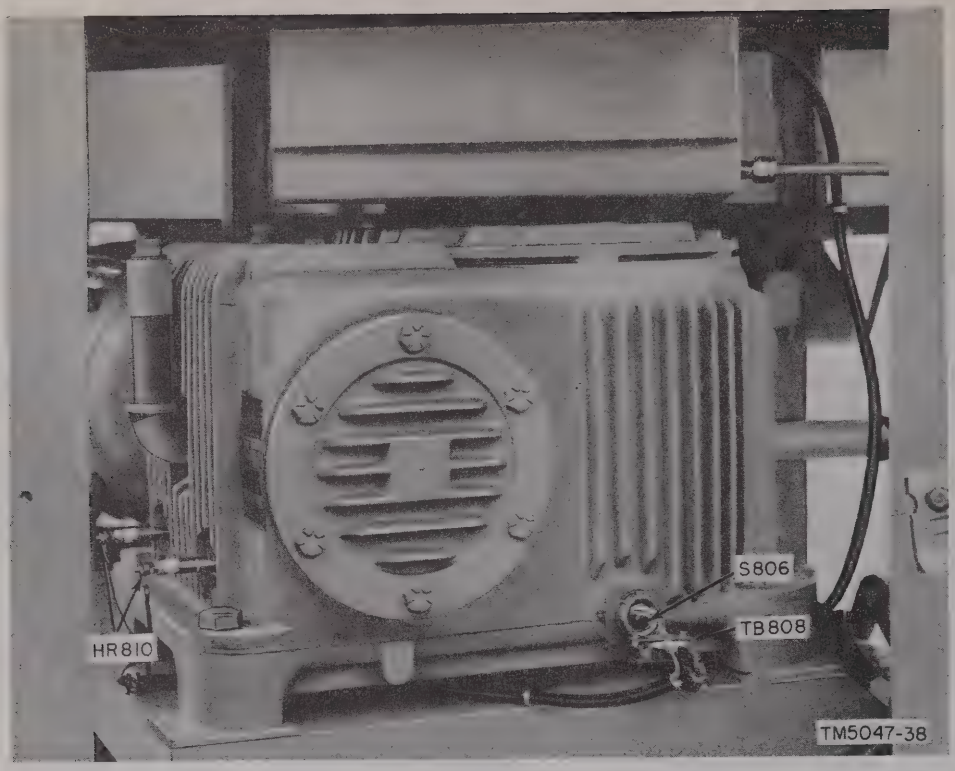


Figure 7–5. Speed reducer, electrical parts.

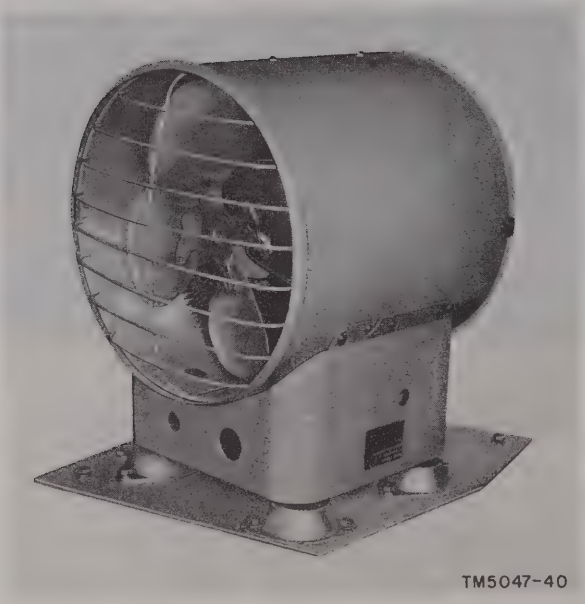


Figure 7–6. Unit heater Z815.

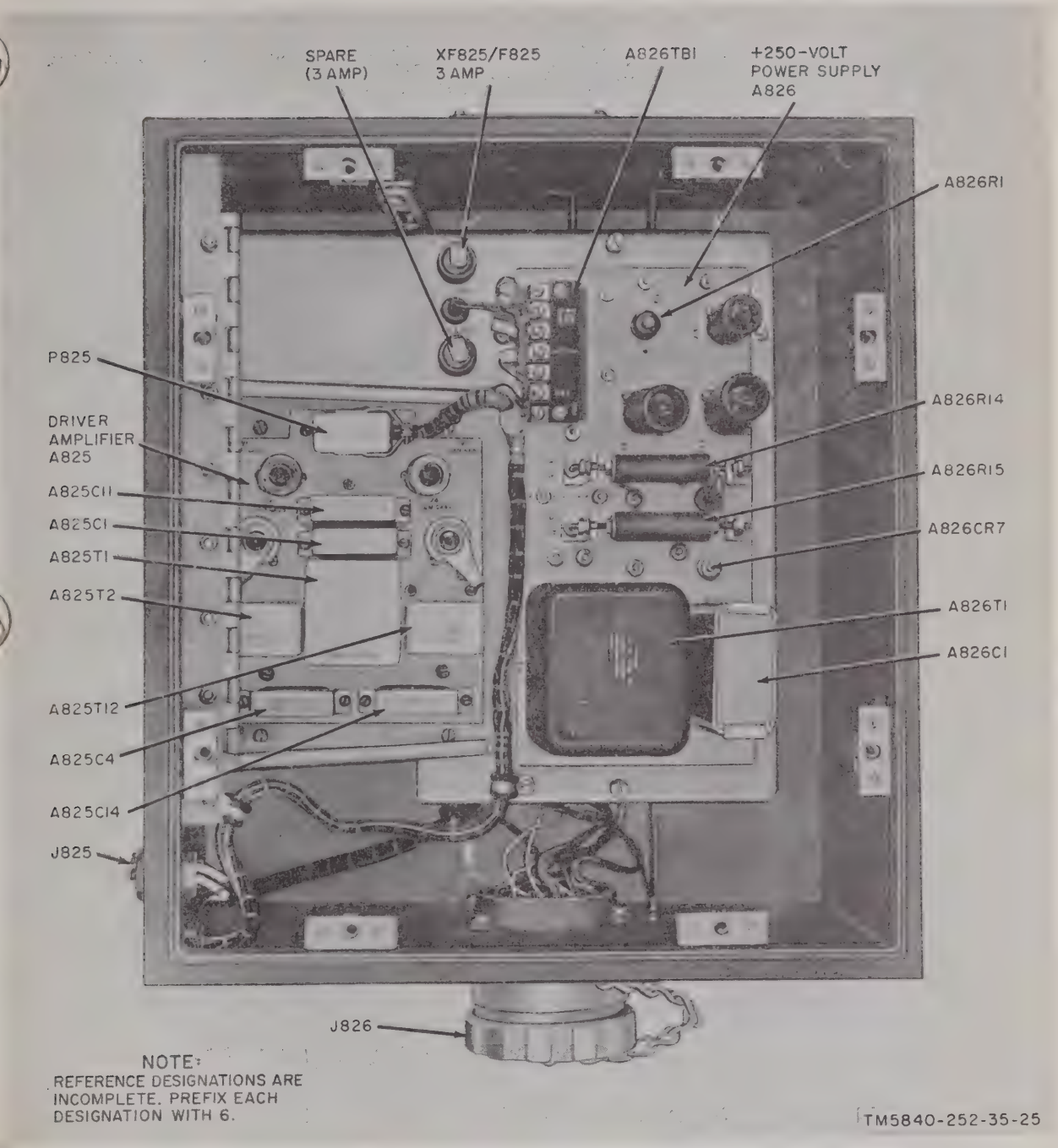


Figure 7-7. Resolver amplifier, top chassis view.

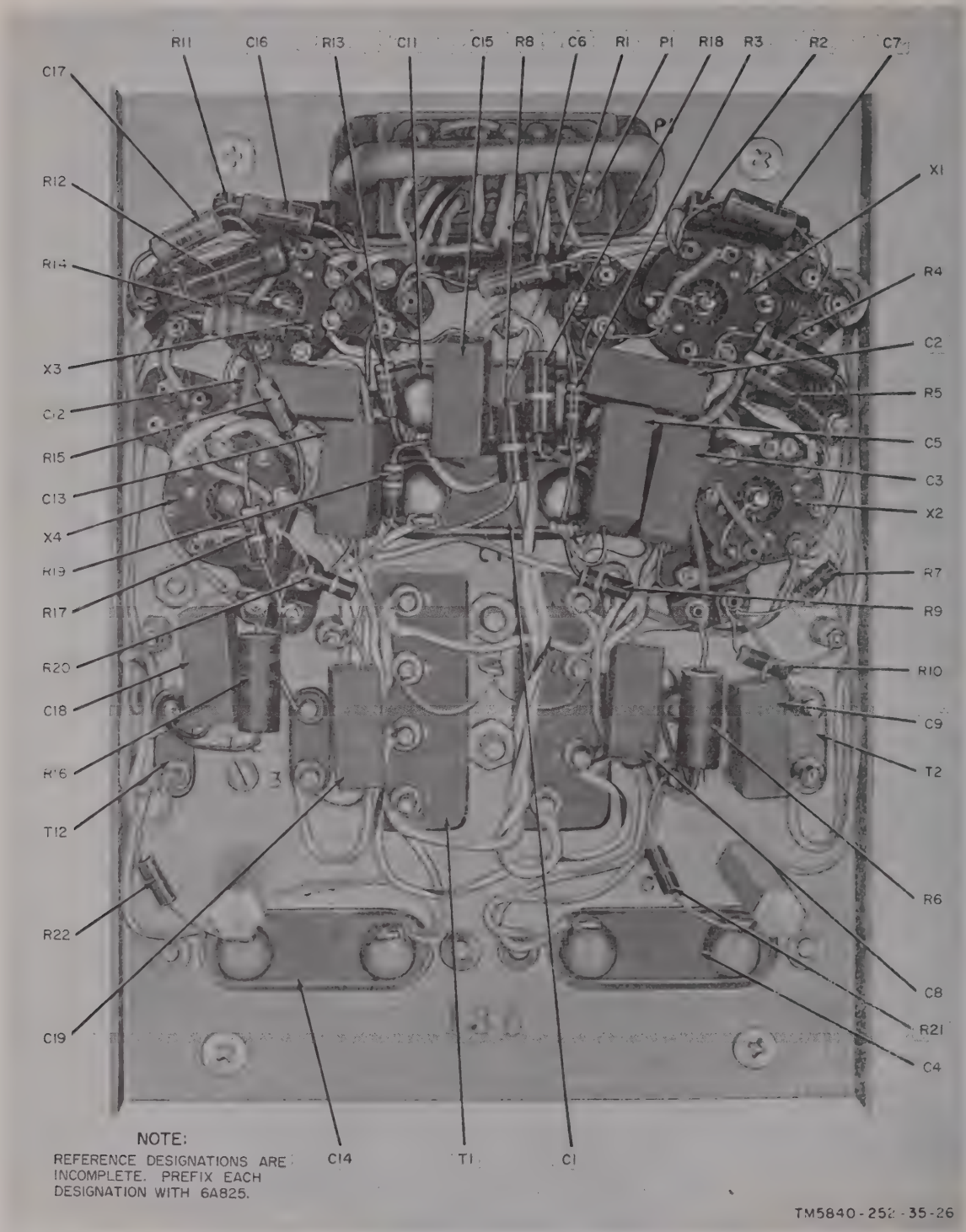


Figure 7-8. Driver amplifier 6A825, underchassis view.

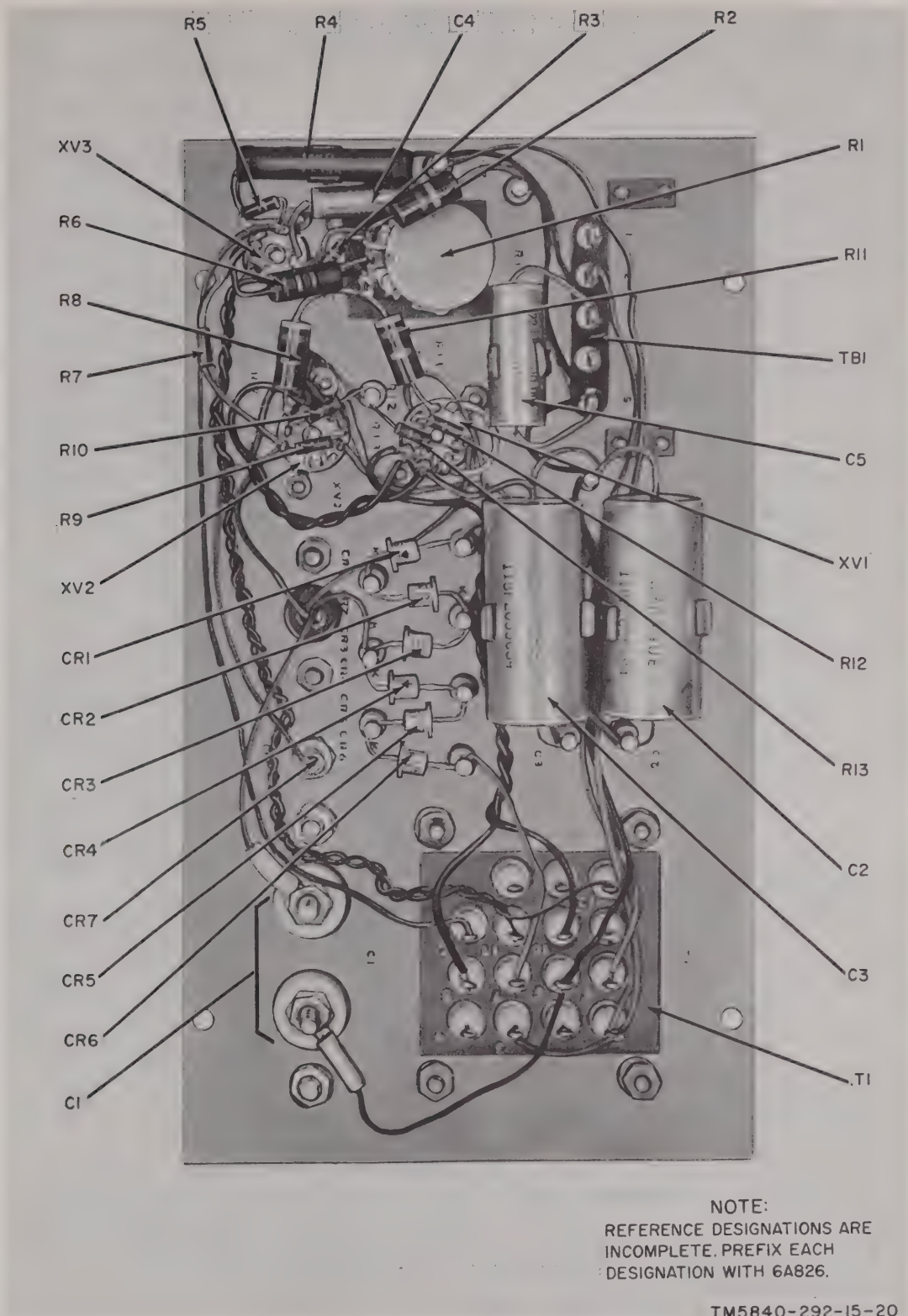


Figure 7-9. Power supply 6A826 (+250-volt), underchassis view.

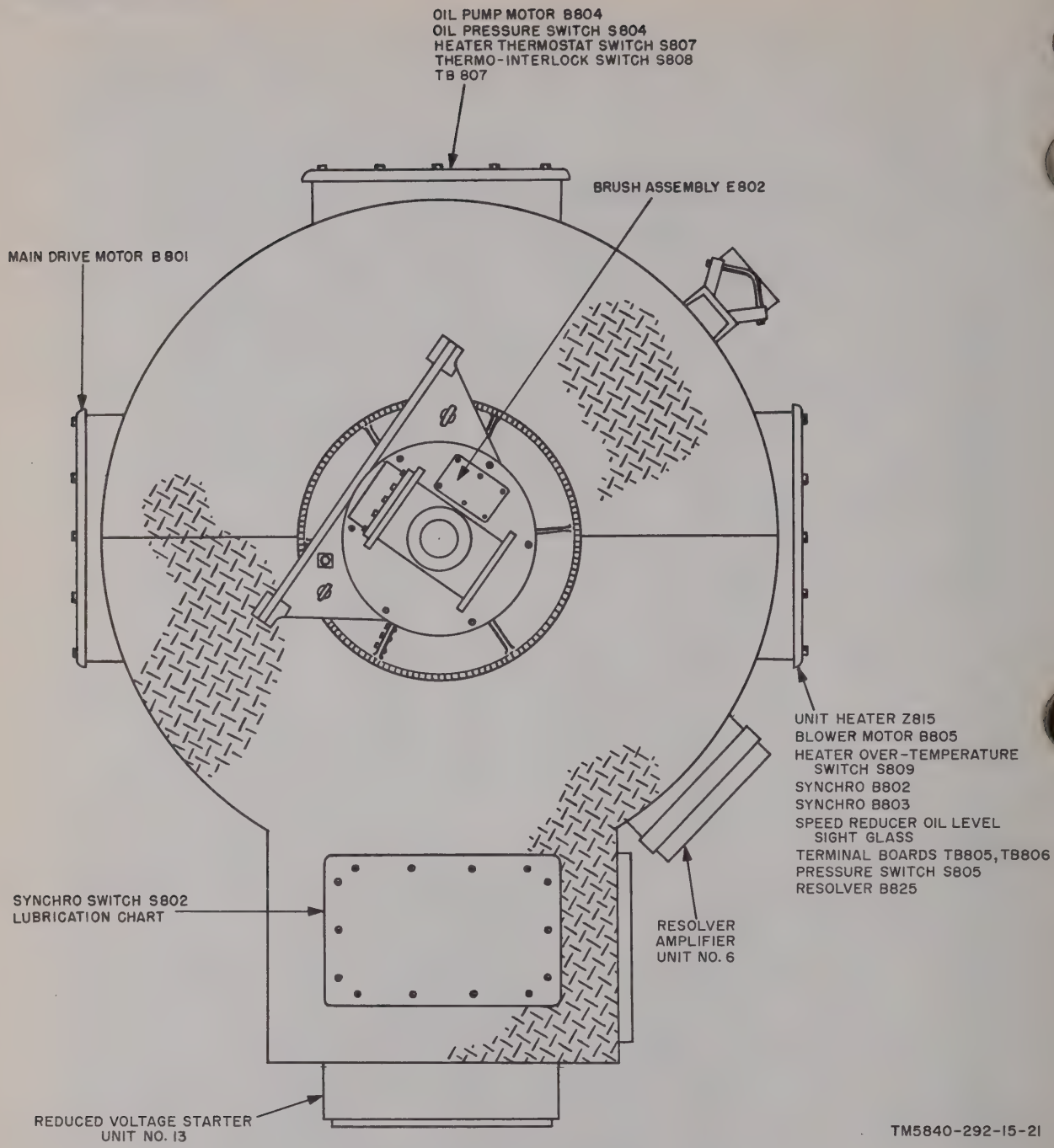


Figure 7–10. Antenna pedestal, access to parts.

f. To close up the resolver amplifier, proceed as follows:

(1) Form the cable harness while swinging the hinged shelf closed.

(2) Fasten the hinged shelf to the amplifier unit with the two knurled captive screws.

(3) Fasten the cover on the front of the resolver amplifier, using the attached eight slotted captive screws.

(4) Position the sunshade over the resolver amplifier so that the slots on each side of the sunshade engage the four slotted

screws in the resolver amplifier brackets. Tighten the four slotted screws.

7–10. Removal of Parts

a. Instructions for the disassembly and reassembly of the pedestal are given in paragraphs 8–1 through 8–51. For detailed instructions for the removal of all parts, refer to the appropriate paragraph in chapter 8.

b. The pedestal contains four access covers which can be dismounted for access to the parts within the pedestal without removing the skin sections. Figure 7–10 locates the reduced voltage starter, the resolver amplifier, and the four access covers, and lists the parts and assemblies that are accessible through these covers.

c. Refer to the following chart for replacement and inspection of the parts and assemblies.

Part or assembly	Removal (para No.)	Replacement (para No.)
Distribution box (E858)	8–10	8–43
Drip pan	8–11	8–42
Drive motor (B801)	8–14	8–39
Dry-air pressure system (S805)	8–13	8–40
Heater thermostat switch (S808)	8–26	8–27
King post	8–25	8–30
Lubrication lines	8–11	8–42
Lubrication oil sump (U801)	8–22	8–31
Reduced voltage starter box	8–3	8–50
Resolver amplifier box	8–2	8–51
Rotary joint, AB–651/FPS–69	8–7	8–45
Rotary joint, AB–876/FPS–71	8–8	8–46
Rotor assembly	8–23	8–30
Shaft coupling (MP863)	8–14	8–39
Shaft seal assembly holder	8–9	8–44
Single-speed gear housing	8–20	8–33
Skin sections	8–4	8–49
Speed reducer (MP864)	8–15	8–38
Synchro (MP828)	8–18	8–35
Synchronizing switch S802	8–11	8–42
Thermal switch (S806)	8–16	8–37
Unit heater Z815	8–12	8–41

7–11. Alignment, Adjustment, and Final Testing

a. Alignment and Adjustment. All alignment and adjustment procedures for the antenna group are given in paragraphs 2–10 through 2–13.

b. Final Testing.

(1) *General.* For best results, Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71 should meet certain performance standards when initially placed in service or after repair or overhaul.

(2) *Voltage standing wave ratio.* Measure the standing wave ratio (voltage) (swr) at an input section of straight waveguide at the base of the pedestal when the antenna is radiating into free space. These measurements should be taken at 5-megacycle steps between 1,250 and 1,350 megacycles. The swr should not exceed 1.35 to 1.

(3) *IFF swr.* Measure the swr at a short section of Radio Frequency Cable RG–14/U or RG–14A/U connected to J805 (via adapter CP1004) at the bottom of the rotary coupler when the IFF dipole is radiating off the reflector into free space. Take these measurements at 5-megacycle steps over the ranges from 1,000 to 1,040 megacycles, and 1,080 to 1,120 megacycles. In the 1,000- to 1,040-megacycle band, the swr should not exceed 1.4 to 1. In the 1,080- to 1,120-megacycle band, the swr should not exceed 1.6 to 1.

(4) *Gear backlash.* The total backlash measured at the single-speed gear housing assembly should not exceed 0.005 inch. The total backlash between the main gear (M848) and the pinion gear (MP865) should not exceed 0.015 inch.

(5) *Running tests.* The antenna should rotate clockwise at a speed of between 5 and 7 rpm and should reach full speed in about 12 seconds after power is applied to the drive motor. When the power is cut off, the antenna should coast smoothly to a stop in about 30 seconds. The lubricating oil should be flowing over the main gear and pinion gear at a rate of between ½ and 1 gallon per minute. The oil pressure gage should read between 5 and 10 pounds per square inch.

Note. To measure oil flow, remove fuses F801, F802, and F803 to disable antenna drive motor B801. Attach a hose to the oil discharge pipe (fig. 2–16). *Do not bend the preformed discharge pipe.* Operate the oil pump and fill a liquid measure of known volume while recording the time. Remove the hose and replace fuses F801, F802, and F803.

CHAPTER 8

DISASSEMBLY AND ASSEMBLY OF MECHANICAL ASSEMBLIES

Section I. DISASSEMBLY OF ANTENNA PEDESTAL

8-1. General

a. This section gives directions for the complete disassembly of Antenna Pedestals AB-651/FPS-69 and AB-876/FPS-71. This procedure is given to assist the repairman in disassembly of the pedestal for inspection, overhaul, or replacement of parts. Disassembly should be attempted only by thoroughly qualified personnel. Follow the procedure outlined and keep all parts clean and dry.

Note. Antenna Pedestal AB-651/FPS-69 is similar to Antenna Pedestal AB-876/FPS-71. Information in this chapter applies to both pedestals, unless otherwise specified.

b. In the procedure which follows, certain assemblies are removed in complete units. The procedures for disassembling these assemblies will be found immediately following the removal procedures for these units.

c. The disassembly procedures and accompanying drawings can be used as a guide for the replacement of parts or assemblies found to be defective.

8-2. Removal of Resolver Amplifier Box
(fig. 8-1)

a. Disconnect plug P827 from jack J827.

b. Removal of Resolver Amplifier Box (11).

(1) Loosen the four $\frac{1}{4}$- by 20- by $\frac{5}{8}$-inch pan-head screws (2), the $\frac{1}{4}$-inch lockwashers (4), and the $\frac{1}{4}$-inch flat washers (3) attached. Remove the sunshade (5) from the sunshade brackets (10).

(2) While supporting the resolver amplifier box (11), remove the four $\frac{3}{8}$-inch by 16- by 2-inch capscrews (6), the eight $\frac{3}{8}$-inch beveled spacers (7), the four $\frac{3}{8}$-inch flat washers (8), and the four $\frac{3}{8}$-inch by 16 self-locking hexagonal nuts (9). Remove the resolver amplifier box (11) and the two sunshade brackets (10). The gasket (12) was applied with an adhesive and may be attached to the resolver amplifier box or to the side skin.

8-3. Removal of Reduced Voltage Starter Box
(fig. 8-1)

a. Disconnect Cables.

(1) Remove the protective cover from the junction box on the side of antenna drive motor B801 (fig. 7-3).

(2) Disconnect and remove the three leads from the junction box on the side of antenna drive motor B801. Tag and identify the leads.

(3) Disconnect and remove the leads from terminals T0, T1, T2, and T3 of terminal board TB1 inside the reduced voltage starter box (15). Tag and identify the four leads.

b. Removal of Reduced Voltage Starter Box (15).

(1) Block the reduced voltage starter box (15) to support the weight while removing the fastening hardware. Use adequate manpower when lifting the reduced voltage starter box.

(2) Loosen and remove the four $\frac{3}{8}$-inch by 16 by 1-inch capscrews (13) and the $\frac{3}{8}$-inch lockwashers (14) that fasten the reduced voltage starter box to the side of the pedestal. Carefully remove the reduced voltage starter box while drawing the cable through the access hole in the side of end skin A861 (46, fig. 8-2).

8-4. Removal of Skin Sections
(fig. 8-2)

a. Remove Side Skin A827 (9).

(1) Loosen and disengage the ten $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screws, the flat wash-

ers, and the lockwashers (1), and lift the cover (2) from the side skin (9).

(2) Loosen and remove the seven $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (5, 6, 7, and 8) that attach the side skin to the cover half sections (56 and 57) of the pedestal.

(3) Loosen and remove the seventeen $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and flat washers (10 and 11), and dismount side skin A827 (9) from the pedestal.

(4) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 3-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (63, 64, 65, and 66, fig. 8–3) that hold the channel assembly (67) to the side skin, and dismount the channel assembly and the parts attached to it.

b. Remove Side Skin A829 (12).

(1) Loosen and remove the seven $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, flat washers, lockwashers, and nuts that fasten the side skin to the cover half sections (56 and 57) of the pedestal.

(2) Loosen and remove the seventeen $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and flat washers, and dismount side skin A829 (12) from the pedestal.

c. Remove Side Skin A831 (20).

(1) Loosen and remove the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, flat washers, lockwashers, and nuts that attach the side skin to the pedestal cover half sections (56 and 57).

(2) Loosen and remove the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and flat washers, and dismount side skin A831 (20) from the pedestal.

d. Remove End Skin A861 (46).

(1) Loosen and disengage the fourteen $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screws (22) that fasten the access cover (23) to pedestal cover half section A853 (57) and lift the access cover off.

(2) Loosen and remove the three $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (24, 25, 26, and 27, fig. 8–2) that attach the drip pan section (181, fig. 8–10) to the support bracket (32, fig. 8–2) on the end skin.

(3) Loosen and remove the four $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (28, 29, 30, and 31) and remove the support bracket (32) with the two attached angle mounting brackets (33) from the end skin.

(4) Loosen and remove the seven $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head capscrews, the flat washers, and the lockwashers (34, 35, and 36), and then remove the cover plate (37) from the end skin (46).

(5) Loosen and remove the four No. 10 by 24 by $\frac{5}{8}$-inch hexagonal-head capscrews, the flat washers, and the lockwashers (38, 39, and 40), and then remove the angle (41) from the end skin.

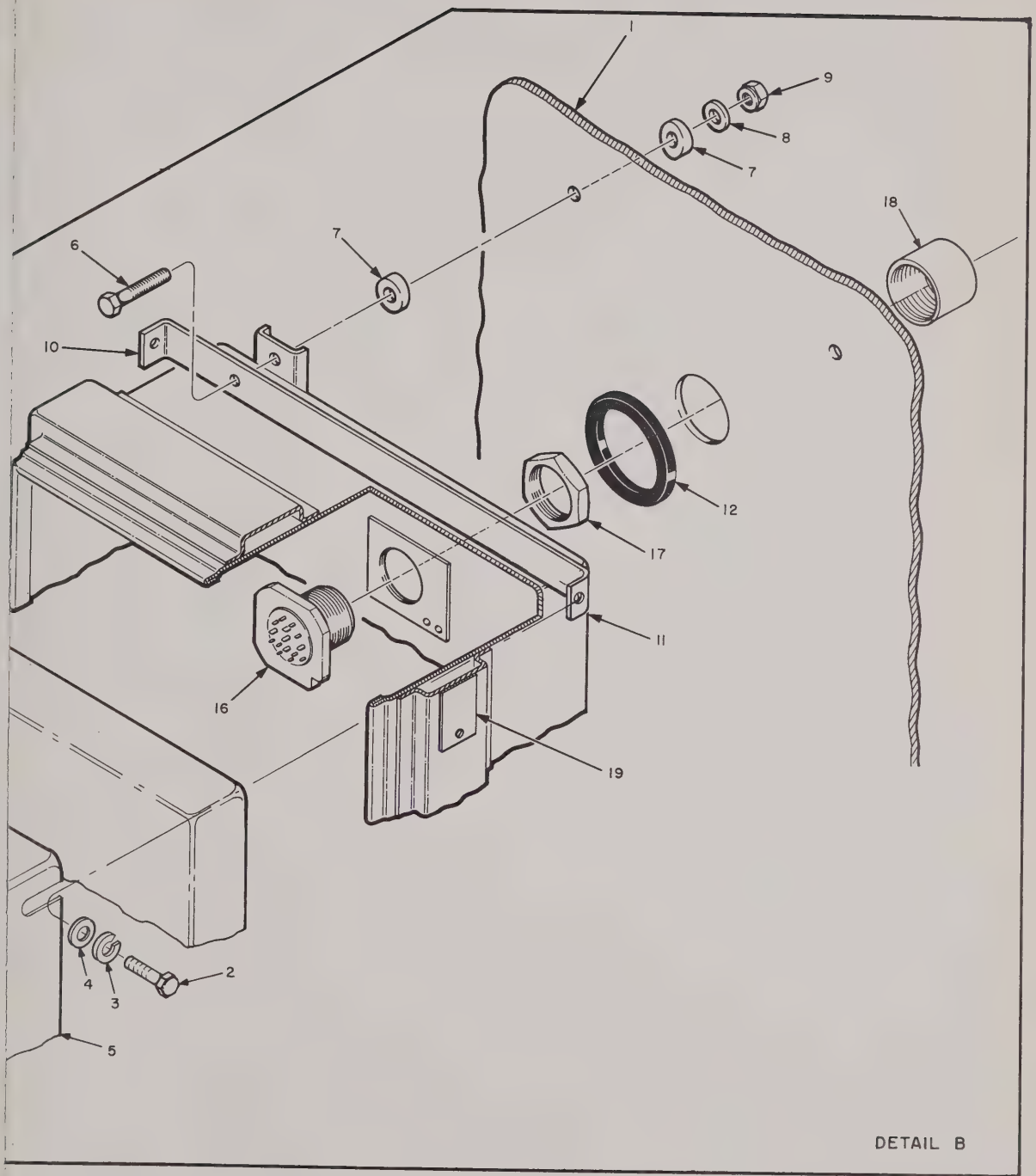
(6) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (5, 6, 7, and 8) that secure the end skin (46) to pedestal cover half section A853 (57).

(7) Loosen and remove the four $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews and the flat washers (42 and 43) that fasten the end skin to the distribution box (53).

(8) Loosen and remove the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and the flat washers (44 and 45), and dismount the end skin (46).

1 Antenna pedestal
2 $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch panhead screw (4)
3 $\frac{1}{4}$-inch flat washer (4)
4 $\frac{1}{4}$-inch lockwasher (4)
5 Sunshade
6 $\frac{3}{8}$-inch by 16 by 2-inch capscrews (4)
7 $\frac{3}{8}$-inch beveled spacer (8)
8 $\frac{3}{8}$-inch flat washer (4)
9 $\frac{3}{8}$-inch by 16 self-locking hexagonal nut (4)
10 Sunshade bracket (2)
11 Resolver amplifier box
12 Gasket
13 $\frac{3}{8}$-inch by 16 by 1-inch capscrew (4)
14 $\frac{3}{8}$-inch lockwasher (4)
15 Reduced voltage starter box
16 Jack J827
17 Locknut
18 Plug P827
19 MWO Identification plate

Figure 8–1. Resolver amplifier and reduced voltage starter boxes, exploded view.



DETAIL B

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ers, and the lockwashers (1), and lift the cover (2) from the side skin (9).

(2) Loosen and remove the seven $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (5, 6, 7, and 8) that attach the side skin to the cover half sections (56 and 57) of the pedestal.

(3) Loosen and remove the seventeen $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and flat washers (10 and 11), and dismount side skin A827 (9) from the pedestal.

(4) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 3-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (63, 64, 65, and 66, fig. 8–3) that hold the channel assembly (67) to the side skin, and dismount the channel assembly and the parts attached to it.

b. Remove Side Skin A829 (12).

(1) Loosen and remove the seven $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, flat washers, lockwashers, and nuts that fasten the side skin to the cover half sections (56 and 57) of the pedestal.

(2) Loosen and remove the seventeen $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and flat washers, and dismount side skin A829 (12) from the pedestal.

c. Remove Side Skin A831 (20).

(1) Loosen and remove the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, flat washers, lockwashers, and nuts that attach the side skin to the pedestal cover half sections (56 and 57).

(2) Loosen and remove the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and flat washers, and dismount side skin A831 (20) from the pedestal.

d. Remove End Skin A861 (46).

(1) Loosen and disengage the fourteen $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screws (22) that fasten the access cover (23) to pedestal cover half section A853 (57) and lift the access cover off.

(2) Loosen and remove the three $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (24, 25, 26, and 27, fig. 8–2) that attach the drip pan section (181, fig. 8–10) to the support bracket (32, fig. 8–2) on the end skin.

(3) Loosen and remove the four $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (28, 29, 30, and 31) and remove the support bracket (32) with the two attached angle mounting brackets (33) from the end skin.

(4) Loosen and remove the seven $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head capscrews, the flat washers, and the lockwashers (34, 35, and 36), and then remove the cover plate (37) from the end skin (46).

(5) Loosen and remove the four No. 10 by 24 by $\frac{5}{8}$-inch hexagonal-head capscrews, the flat washers, and the lockwashers (38, 39, and 40), and then remove the angle (41) from the end skin.

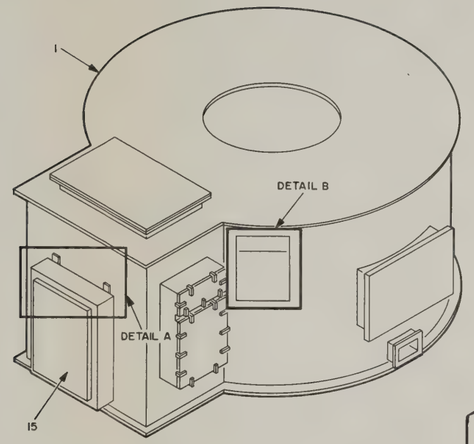
(6) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews, the flat washers, the lockwashers, and the nuts (5, 6, 7, and 8) that secure the end skin (46) to pedestal cover half section A853 (57).

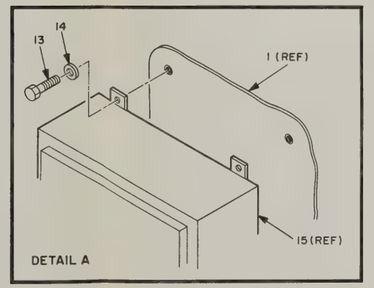
(7) Loosen and remove the four $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews and the flat washers (42 and 43) that fasten the end skin to the distribution box (53).

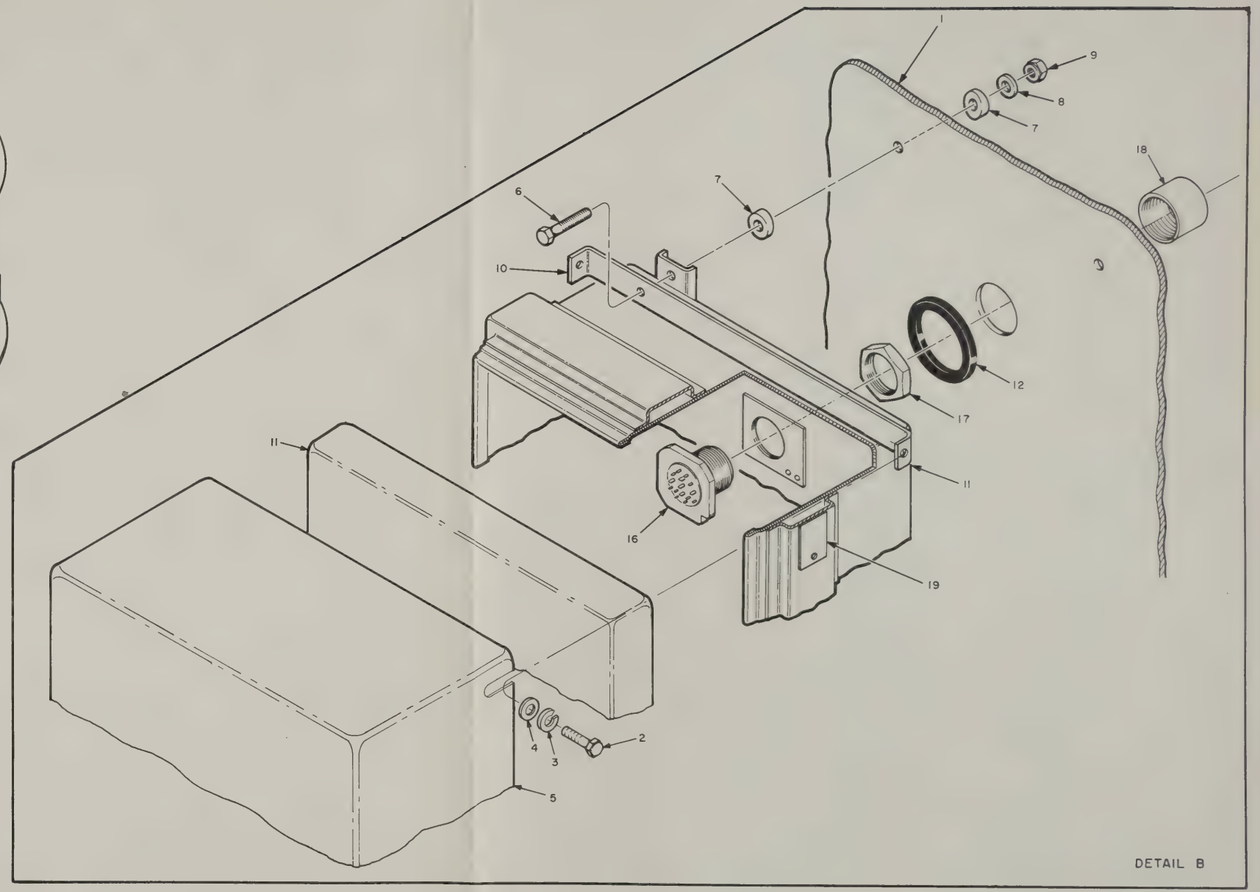
(8) Loosen and remove the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews and the flat washers (44 and 45), and dismount the end skin (46).

1 Antenna pedestal
2 $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch panhead screw (4)
3 $\frac{1}{4}$-inch flat washer (4)
4 $\frac{1}{4}$-inch lockwasher (4)
5 Sunshade
6 $\frac{3}{8}$-inch by 16 by 2-inch capscrews (4)
7 $\frac{3}{8}$-inch beveled spacer (8)
8 $\frac{3}{8}$-inch flat washer (4)
9 $\frac{3}{8}$-inch by 16 self-locking hexagonal nut (4)
10 Sunshade bracket (2)
11 Resolver amplifier box
12 Gasket
13 $\frac{3}{8}$-inch by 16 by 1-inch capscrew (4)
14 $\frac{3}{8}$-inch lockwasher (4)
15 Reduced voltage starter box
16 Jack J827
17 Locknut
18 Plug P827
19 MWO Identification plate

Figure 8–1. Resolver amplifier and reduced voltage starter boxes, exploded view.







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8–5. Removal of 3-Foot Waveguide Section and Window Assembly

a. Antenna Pedestal AB–651/FPS–69. Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 2-inch socket-head screws, the lockwashers, and the flat washers that fasten the 3-foot waveguide section, waveguide window, and waveguide gaskets to the lower waveguide transition as shown in B, figure 2–5. The 10 socket-head screws thread directly into the threaded inserts in the lower waveguide transition flange. Separate and remove the waveguide window and the two waveguide gaskets together with the 3-foot waveguide section.

b. Antenna Pedestal AB–876/FPS–71.

(1) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screws, the flat washers, and the $\frac{5}{16}$-inch by 18 self-locking hexagonal nuts that fasten the 3-foot waveguide section, the waveguide window, and the special waveguide gaskets to the short waveguide section as shown in figure 2–6. Separate and remove the waveguide window, the two special waveguide gaskets, and the 3-foot waveguide section.

(2) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 1-inch socket-head screws, the lockwashers, and the flat washers that fasten the short waveguide section and the special waveguide gasket to the lower waveguide transition. The 10 socket-head screws thread directly into the threaded inserts in the lower waveguide transition flange.

8–6. Removal of Waveguide Window from Upper Waveguide Transition

a. Antenna Pedestal AB–651/FPS–69. Loosen and remove the ten $\frac{5}{16}$-inch by 18 by $2\frac{3}{4}$-inch socket-head screws, the lockwashers, and the flat washers that fasten the waveguide run to the antenna horn, the waveguide window, and the pressure regulator, and the two waveguide gaskets to the upper waveguide transition as shown in A, figure 2–5. The 10 socket-head screws thread directly into the threaded inserts in the upper waveguide transition flange.

b. Antenna Pedestal AB–876/FPS–71.

(1) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screws, the flat washers, and the $\frac{5}{16}$-inch by 18 self-locking hexagonal nuts that fasten the waveguide (run to the antenna horn), the waveguide window, and the special gaskets to the short waveguide section as shown in figure 2–6. Separate and remove the waveguide window and the two special waveguide gaskets.

(2) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by 1-inch socket-head screws, the lockwashers, and the flat washers that fasten the short waveguide section and the special waveguide gasket to the upper waveguide transition. The 10 socket-head screws thread directly into the threaded inserts in the upper waveguide transition flange.

8–7. Removal and Disassembly Procedure of Triple-Channel Rotary Joint for Antenna Pedestal AB–651/FPS–69 (fig. 9–9)

Note. This procedure requires a minimum working crew of three men and at times entails simultaneous operations at both the upper end and the lower end of the rotary joint.

a. Removal Procedure of IFF Rf Transmission Line Adapter (29) and Attaching Parts.

(1) Disconnect and remove plug P807 (of cable W60) from angle adapter CP1000 on top of the rotary joint. Disconnect and remove plug P803 (cable W854) from adapter CP1002 (fig. 6–3).

(2) Remove the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (7, fig. 9–9), the eight $\frac{1}{4}$-inch flat washers (5 and 6), the four $\frac{1}{4}$-inch lockwashers (4), and the $\frac{1}{4}$-inch by 20 hexagonal nuts (3) that fasten the two line section guards (1 and 2) together.

(3) Remove the six $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch socket-head screws (8), the $\frac{1}{4}$-inch lockwashers (9), and the $\frac{1}{4}$-inch flat washers (10) that fasten the two line section guards (1 and 2) to the main rf transmission line section (41). Remove the two line section guards.

(4) Remove the three $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head screws (16), the $\frac{1}{4}$-inch lockwashers (17), and the $\frac{1}{4}$-inch hexagonal nuts (18) that fasten the EIA-type angle adapter (12) to jack J807 (15). Remove the EIA-type angle adapter (12), the contact (13), and the O-ring gasket (14). The

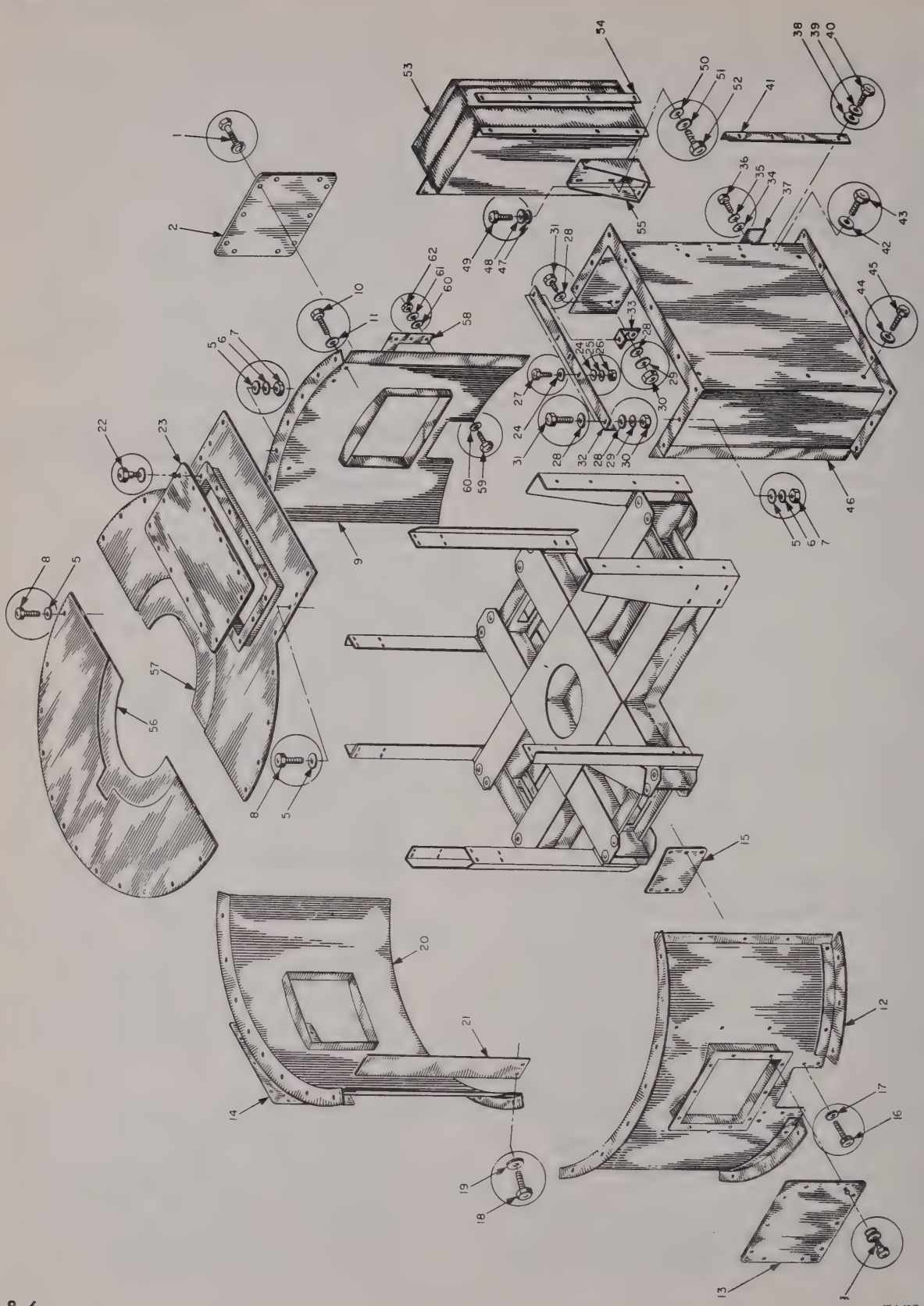


Figure 8-2. Skin sections, exploded view.

1 $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screw
2 Cover (A846)
5 $\frac{5}{16}$-inch flat washer
6 $\frac{5}{16}$-inch lockwasher
7 $\frac{5}{16}$-inch by 18 hexagonal nut
8 $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrew
9 Side skin (A827)
10 $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrew
11 $\frac{5}{16}$-inch flat washer
12 Side skin (A829)
13 Cover (A848)
14 Cover (A847)
15 Cover (A852)
16 $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrew
17 $\frac{5}{16}$-inch flat washer
18 $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrew
19 $\frac{5}{16}$-inch flat washer
20 Side skin (A831)
21 Butt straps (MP876, MP877)
22 $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screw
23 Cover (A854)
24 $\frac{5}{16}$-inch flat washer
25 $\frac{5}{16}$-inch lockwasher
26 $\frac{5}{16}$-inch by 18 hexagonal nut
27 $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrew
28 $\frac{1}{4}$-inch flat washer
29 $\frac{1}{4}$-inch lockwasher
30 $\frac{1}{4}$-inch by 20 hexagonal nut
31 $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch hexagonal-head capscrew
32 Support bracket (A858)
33 Angle brackets (A859, A860)
34 $\frac{1}{4}$-inch flat washer
35 $\frac{1}{4}$-inch lockwasher
36 $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head capscrew
37 Cover plate (A886)
38 No. 10 flat washer
39 No. 10 lockwasher
40 10 by 24 by $\frac{5}{8}$-inch hexagonal-head capscrew
41 Angle (A869)
42 $\frac{1}{4}$-inch flat washer
43 $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrew
44 $\frac{5}{16}$-inch flat washer
45 $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrew
46 End skin (A861)
47 $\frac{3}{8}$-inch flat washer
48 $\frac{3}{8}$-inch lockwasher
49 $\frac{3}{8}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrew
50 $\frac{1}{4}$-inch flat washer
51 $\frac{1}{4}$-inch lockwasher
52 $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch hexagonal-head capscrew
53 Distribution box (E858)
54 Spacer
55 Mounting bracket (A873)
56 Pedestal cover half section (A845)
57 Pedestal cover half section (A853)
58 Shield (A889)
59 $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrew
60 $\frac{5}{16}$-inch flat washer
61 $\frac{5}{16}$-inch lockwasher
62 $\frac{5}{16}$-inch by 18 hexagonal nut

Figure 8–2.—Continued

O-ring gasket (11) is shown for reference purposes.

(5) Remove the locking nut (24) that holds J807 (15) to the IFF rf transmission line section (26). Remove jack J807 (15), the O-ring gasket (21), the slotted sleeve (22), the internal tapered spacer (23), the O-ring gasket (160), and the locking nut (24).

(6) Remove the plug (20) and the associated O-ring gasket (19) from the side of jack J807 (15).

(7) Remove the packing nut (27) and the round rubber section seal (28) that hold the IFF rf transmission line section (26) to the IFF rf transmission line adapter (29).

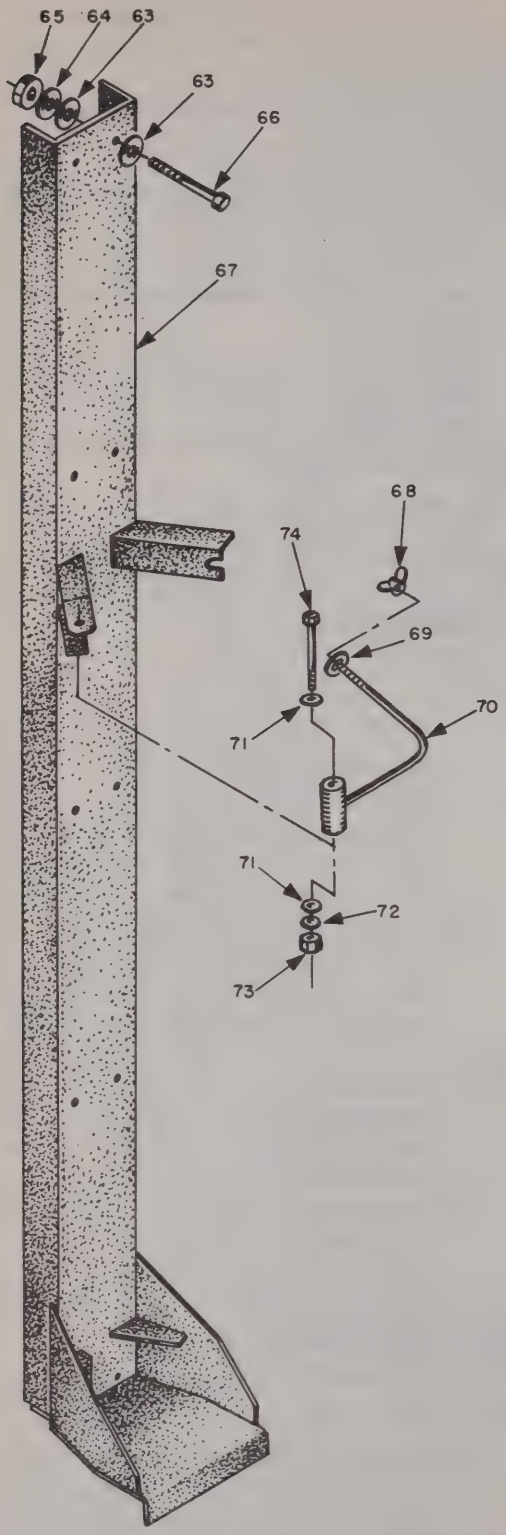
(8) To facilitate reassembly, place an aligning identification mark on the outer flange edge of the IFF rf transmission line adapter (29) and the end sleeve (38). Place another identification mark on the outer edge of the main rf transmission line section (41) and the top of the upper waveguide transition (49). Place another identification mark on the bottom of the upper waveguide transition (49) (not on the flange-type retaining ring (53)) and the top of the dome (63). Place a final set of identification marks on the outer edge of the dome (63), the spacer adapter (70), and the adjacent rotor (106, fig. 8–6).

(9) Remove the four 8 by 32 by $\frac{3}{4}$-inch socket-head screws (34), the No. 8 lockwashers (35), and the No. 8 flat washers (36). Slide the IFF rf transmission line adapter (29) and the rubber gasket (37) off the IFF rf transmission line section (26). Remove the end sleeve (38), the second rubber gasket (37), and the O-ring gasket (40) from around the end sleeve (38).

(10) Remove the 8 by 32 by $\frac{5}{8}$-inch fillister-head screw (33) and the No. 8 lockwasher (32), and then remove the upper IFF contact (31). The O-ring gasket (30) is shown for reference purposes.

b. Removal and Disassembly Procedure of Conductor Housing (138) and Attaching Parts.

(1) Disconnect and remove EIA-type angle adapter CP1013 (between J806 and P546 of cable W59) from jack J806 on the bottom of the rotary joint. Disconnect and remove EIA-type adapter CP1004 (be-



63 $\frac{3}{8}$-inch flat washer
64 $\frac{3}{8}$-inch lockwasher
65 $\frac{3}{8}$-inch by 16 hexagonal nut
66 $\frac{3}{8}$-inch by 16 by 3-inch hexagonal-head capscrew
67 Channel assembly (A892)
68 $\frac{3}{8}$-inch by 16 thumbnut
69 $\frac{3}{8}$-inch flat washer
70 Clamping rod assembly (MP1846)
71 $\frac{3}{8}$-inch flat washer
72 $\frac{3}{8}$-inch lockwasher
73 $\frac{3}{8}$-inch by 16 hexagonal nut
74 $\frac{3}{8}$-inch by 16 by $4\frac{1}{2}$-inch hexagonal-head capscrew

Figure 8–3.—Continued

Figure 8–3. Dry-air cylinder holder assembly, exploded view.

tween J805 and P805 of cable W90) from jack J805 on the bottom of the rotary joint (fig. 6–3).

(2) Remove the three 10 by 24 by $\frac{5}{8}$-inch fillister-head screws (159) and the No. 10 lockwashers (158) that hold the connector adapter (157) to the bottom of the choke body (149). Remove the connector adapter (157), the O-ring gasket (153), and the reference line section contact (155) with the spacer insulator (156) and the teflon sleeve (154) attached.

(3) Remove the 8 by 32 by $\frac{7}{8}$-inch fillister-head screw (143) and the No. 8 lockwasher (142) that hold the lower IFF contact (141) to the threaded boss on the side of the choke body (149). Remove the lower IFF contact.

(4) Remove the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (151), the twelve $\frac{1}{4}$-inch flat washers (150 and 145), and the six $\frac{1}{4}$-inch by 20 self-locking hexagonal nuts (144) that hold the choke body (149) to the conductor housing (138). Remove the choke body (149) and the attaching choke assembly (147) along with the O-ring gasket (146).

(5) Remove the pipe plug (152) from the bottom flange of the choke body (149).

Note. The choke assembly (147) should not be removed from the choke body (149) unless absolutely necessary. The special shim (148) is made up of a number of laminated shims 0.003 inch thick. Once the correct shim thickness is determined, sealing compound is applied to the threads on the choke body (149) and the choke assembly (147) and the two parts along with the shim are assembled.

(6) The choke assembly (147) and the choke body (149) are disassembled when either

part is to be replaced or when the correct thickness of the special shim (148) must be determined. The thickness of the special shim (148) must be reestablished when the upper choke (134), the ball bearing (132), the conductor housing (138), the choke assembly (147), or the choke body (149) is replaced with new parts.

(7) If the choke assembly (147) and the choke body (149) must be disassembled, perform the following procedure:

(*a*) Secure the choke body portion of the assembly to prevent rotation.

(*b*) Apply heat (open flame) to the threaded junction between the choke body and the choke assembly.

(*c*) While applying heat around the threaded junction (using gloves or protective material), *apply only hand pressure* to unscrew the assembly.

Caution: **The use of handtools to separate this assembly could result in too much torque and damage to the threads or scratching of the metal surfaces.**

(8) While the man stationed at the top of the rotary joint holds the IFF rf transmission line section, outer conductor (39), have a second man at the bottom of the rotary joint remove the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (140), the twelve $\frac{1}{4}$-inch flat washers (139 and 130), and the six $\frac{1}{4}$-inch by 20 self-locking hexagonal nuts (129) that hold the conductor housing (138) to the adapter (124). Remove the conductor housing (138), the O-ring gasket (137), and attaching parts.

(9) Remove the sleeve bearing (135) from inside the upper end of the conductor housing (138).

(10) Remove the internal retaining ring (133) from the top inside of the conductor housing followed by the sleeve (136).

c. Removal and Disassembly Procedure of Adapter (124), Upper Choke (134), and Attaching Parts.

(1) Carefully lower the IFF rf transmission line section, outer conductor (39) until the top flange bottoms on the recessed portion of the main rf transmission line section (41).

(2) Remove the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (121), the $\frac{1}{4}$-inch lockwashers (122), and the $\frac{1}{4}$-inch flat washers (123), and remove the upper choke (134) from the bottom end of the IFF rf transmission line section, outer conductor (39).

(2) Remove the external retaining ring (131) and the ball bearing (132) from the upper choke (134).

(4) Remove the six $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (127), the $\frac{1}{4}$-inch lockwashers (126), and the $\frac{1}{4}$-inch flat washers (125) that hold the adapter (124) to the bearing and choke housing (105). Remove the adapter (124) and the O-ring gasket (118).

(5) Remove the pipe-to-tube adapter (128) from the side of the adapter (124).

(6) Remove the external retaining ring (120) from the bottom end of the IFF rf transmission line section, outer conductor (39) and remove the flange-type retaining ring (119).

d. Removal and Disassembly Procedure of IFF and Reference Rf Transmission Line Sections (39, 26, and 25).

(1) Push the IFF rf transmission line section, outer conductor (39) up from the bottom of the rotary joint. Carefully pull the IFF rf transmission line section, outer conductor (39) out through the top of the rotary joint with the IFF and reference transmission line sections (26 and 25) inside.

Caution: **Unless absolutely necessary, do not remove the IFF and reference transmission line sections (26 and 25) without the support of the IFF rf transmission line section, outer conductor (39). Because of fragility and lack of support, damage can result to the two transmission lines if removed without the support of the IFF rf transmission line section, outer conductor (39).**

(2) Lay the IFF rf transmission line section, outer conductor (39) down on a flat surface

and carefully remove the IFF rf transmission line section (26).

e. Removal and Disassembly of Lower Waveguide Transition (102).

(1) Remove the internal retaining ring (117) and the collar bearing (116) and attaching parts.
(2) Remove the external retaining ring (110) followed by the ball bearing (111).
(3) Remove the two external retaining rings (112 and 113) followed by the ball bearing (114).
(4) Remove the two preformed O-rings (115) from inside the collar bearing (116).
(5) Remove the six 10 by 24 by 1½-inch socket-head screws (108), the No. 10 lockwashers (107), and the No. 10 flat washers (106) that hold the bearing and choke housing (105) to the bottom of the lower waveguide transition (102). Remove the bearing and choke housing (105), the O-ring gasket (104), and the lower dielectric sleeve (103).
(6) Remove the six ¼-inch by 20 by 1-inch hexagonal-head screws (99), the ¼-inch lockwashers (100), and the ¼-inch flat washers (101) that hold the lower waveguide transition (102) to the bottom of the tube assembly (81). Remove the lower waveguide transition (102) and the O-ring gasket (98).
(7) Remove the external retaining ring (97) that holds the flange-type retaining ring (96) to the bottom of the tube assembly (81).

f. Removal and Disassembly of Main Rf Transmission Line Section (41).

(1) Remove the six 10 by 24 by ⅞-inch socket-head screws (42), the No. 10 lockwashers (43), and the No. 10 flat washers (44) that hold the flange-type retaining ring (45) to the upper waveguide transition (49).
(2) Carefully raise the main rf transmission line section (41) until the bottom end clears the top of the rotary joint.
(3) Remove the O-ring gasket (47) from the groove in the upper end of the main rf transmission line section (41).
(4) Remove the external retaining ring (46) followed by the flange-type retaining ring (45) from the upper end of the main rf transmission line section (41).
(5) Remove the upper dielectric sleeve (48) from inside the top of the upper waveguide transition (49).

g. Removal of Dome (63) and Tube Assembly (81) with Attaching Parts. Remove the dome and tube assembly with attaching parts as a complete assembly and disassemble it, if necessary, on a bench. Be extremely careful when lifting the assembly from the pedestal. Lift it straight up or serious damage may result. Use a crane or other lifting device for removing the assembly, and station two men on top of the pedestal to guide it.

(1) Disconnect the four conductors of the accessory cable (part of slipring assembly (collector ring, fig. 8–25)) from terminals 21, 22, 23, and 24 on terminal board TB805. Remove the cable clamp screw and withdraw the accessory cable from the cable clamp. Carefully push the cable up inside the king post between the conductor tube and the king post, leaving about 2 feet of cable.
(2) Remove the eight ¼-inch by 20 by ⅞-inch socket-head screws (58, fig. 9–9), the ¼-inch lockwashers (59), and the ¼-inch flat washers (60) that hold each access cover (61) to the dome (63). Remove the two access covers (61) and the rubber gaskets (62).
(3) If cables enter the dome (63) through the threaded access (in place of pipe plug (57)) and connection is made to the slip-ring brush assembly contacts, perform the procedures given in (*a*) and (*b*) below. If there is no connection made to the slipring brush assembly contacts, omit (*a*) and (*b*) below and proceed with (4) below.
   (*a*) Tag and identify the lead connections. Disconnect and remove the cable connections from the slipring brush assembly.
   (*b*) Remove the cable fitting and cable from the top of the dome (63).
(4) Remove the six $\frac{5}{16}$-inch by 18 by 1¾-inch socket-head screws (64), the $\frac{5}{16}$-inch lock-

washers (65), and the $\frac{5}{16}$-inch flat washers (66) that hold the dome (63) to the spacer adapter (70).

(5) Lift the dome (63) and the tube assembly (81) with attaching parts approximately 6 inches and place two wooden blocks between the dome (63) and the spacer adapter (70).

(6) Loosen and remove the two 10 by 24 by $1\frac{1}{2}$-inch binder-head machine screws (436, fig. 8–25) and the No. 10 lockwashers (437) that hold the brush assembly (438), the spacer (439), and the shim (440) to the oil seal retainer ring (448). Remove the brush assembly and associated parts.

(7) Loosen and remove the four 10 by 24 by $\frac{3}{4}$-inch binder-head machine screws (441) and the No. 10 lockwashers (442) that hold the collector ring to the bearing retainer ring (452).

(8) Prepare a sling (preferably of web strapping) and pass it through the two access openings in the dome (63, fig. 9–9). Hook a lifting device to the sling and lift slowly and carefully. Remove the accessory cable (available under the collector ring) in unison with the dome (63) and the tube assembly (81). Station two men on the pedestal to guide the assembly and withdraw the accessory cable as the assembly is being lifted. After the tube assembly (81) has been lifted clear of the rotor and the accessory cable is clear of the tube assembly, carefully remove the dome and tube assembly to a bench for further disassembly.

(9) Remove the O-ring gasket (71) from the groove around the inside top edge of the spacer adapter (70).

(10) Remove the six $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch socket-head screws (67), the $\frac{5}{16}$-inch lockwashers (68), and the $\frac{5}{16}$-inch flat washers (69) that hold the spacer adapter (70) to the rotor (106, fig. 8–6). Remove the spacer adapter (70, fig. 9–9) and the O-ring gasket (444, fig. 8–25).

h. Disassembly of Dome (63) and Tube Assembly (81).

(1) Remove the six $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (50), $\frac{1}{4}$-inch lockwashers (51), and the $\frac{1}{4}$-inch flat washers (52) that hold the flange-type retaining ring (53) to the dome (63). Remove the upper waveguide transition (49) from the top of the dome (63).

(2) Remove the O-ring gasket (55) followed by the external retaining ring (54) and the flange-type retaining ring from the lower portion of the upper waveguide transition (49). Remove the dielectric sleeve (56).

(3) Remove the six $\frac{1}{4}$-inch by 20 by 20 by 1-inch socket-head screws (90), the $\frac{1}{4}$-inch lockwashers (89), and the $\frac{1}{4}$-inch flat washers (88) that hold the flange-type retaining ring (87) to the underside of the dome (63). Carefully remove the dome (63), the O-ring gasket (73), the laminated shim halfset (72), and the flange-type retaining ring (87).

(4) Remove the eight 8 by 32 by $\frac{1}{2}$-inch socket-head screws (94), the No. 8 lockwashers (93), and the No. 8 flat washers (92) that hold the housing end plate (91) to the lower end of the upper bearing housing (86). Remove the encased seal (83).

(5) Remove the external beveled retaining ring (74). Slide the upper bearing housing (86) off the top end of the tube assembly (81).

(6) Remove the baffle spacer (75), the laminated shim (76), and the ball bearing (77) from inside the upper bearing housing (86).

(7) Remove the internal beveled retaining ring (79), the ball bearing (80), and the O-ring gasket (85) from inside the upper bearing housing (86).

(8) Remove the encased seal (82) and the O-ring gasket (84) from the tube assembly (81).

8–8. Removal and Disassembly Procedure of Triple-Channel Rotary Joint for Antenna Pedestal AB–876/FPS–71 (fig. 9–10)

Note. This procedure requires a minimum working crew of three men and at times entails simultaneous operations at the upper end and the lower end of the rotary joint.

a. Removal Procedure of IFF Rf Transmission

Line Adapter (29), Attaching Parts, and Drive Housing (36).

(1) Disconnect and remove plug P807 (of cable W60) from angle adapter CP1000 on top of the rotary joint. Disconnect and remove plug P803 (cable W854) from adapter CP1002 (fig. 6-3).

(2) Remove the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (3), the eight $\frac{1}{4}$-inch flat washers (4), the four $\frac{1}{4}$-inch lockwashers (5), and the four $\frac{1}{4}$-inch by 20 hexagonal nuts (6) that fasten the two line section guards (1 and 2) together.

(3) Remove the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket-head screws (7), the six $\frac{1}{4}$-inch lockwashers (8), and the six $\frac{1}{4}$-inch flat washers (9) that fasten the two line section guards (1 and 2) to the drive housing (36). Remove the two line section guards.

(4) Remove the three $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head screws (14), the $\frac{1}{4}$-inch lockwashers (15), and the $\frac{1}{4}$-inch by 20 hexagonal nuts (16) that fasten the EIA-type angle adapter (11) to jack J807 (17). Remove the EIA-type angle adapter (11), the contact (12), and the O-ring gasket (13).

(5) Remove the locking nut (23) that holds jack J807 (17) to the IFF rf transmission line section (25). Remove jack J807 (17), the O-ring gasket (20), the slotted sleeve (21), the internal tapered spacer (22), the O-ring gasket (118), and the locking nut (23).

(6) Remove the plug (19), the associated O-ring gasket (18), and the contact (12) from jack J807 (17).

(7) Remove the packing nut (26) and the round rubber section seal (27) that hold the IFF rf transmission line section (25) to the IFF rf transmission line adapter (28).

(8) To facilitate reassembly, place an aligning identification mark on the outer flange edge of the IFF rf transmission line adapter (28) and the mating edge of the drive housing (36).

(9) Remove the four 8 by 32 by $\frac{3}{4}$-inch socket-head screws (32), the No. 8 lockwashers (33), and the No. 8 flat washers (34) that hold the IFF rf transmission line adapter to the drive housing. Slide the IFF rf transmission line adapter (28) off the IFF rf transmission line section, and then remove the drive housing (36) and the two rubber gaskets (35 and 37). Remove the rubber gasket (39).

(10) Remove the 8 by 32 by $\frac{5}{8}$-inch fillister-head screw (30) that holds the upper IFF contact to the IFF rf transmission line adapter (28). Remove the upper IFF contact.

b. Removal and Disassembly Procedure of Conductor Housing (99) and Attaching Parts.

(1) Disconnect and remove EIA-type angle adapter CP1003 (between J806 and P546 of cable W59) from jack J806 on the bottom of the rotary joint. Disconnect and remove EIA-type adapter CP1004 (between J805 and P805 of cable W90) from jack J805 on the bottom of the rotary joint (fig. 6-3).

(2) Remove the three 10 by 24 by $\frac{5}{8}$-inch fillister-head screws (117) that hold the connector adapter (116) to the bottom of the choke body (108). Remove the connector adapter (116), the O-ring gasket (112), and the reference line section contact (114) with the spacer insulator (115) and the teflon sleeve (113) attached.

(3) Remove the 8 by 32 by $\frac{7}{8}$-inch fillister-head screw (101) that fastens the lower IFF contact (100) to the choke body (108). Remove the screw and lower IFF contact.

(4) Remove the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (110), the twelve $\frac{1}{4}$-inch flat washers (109 and 104), the six $\frac{1}{4}$-inch lockwashers (103), and the six $\frac{1}{4}$-inch by 20 hexagonal nuts (102) that hold the choke body (108) to the conductor housing (99). Remove the choke body and attaching choke assembly together with the O-ring gasket (107).

(5) Remove the pipe plug (111) from the bottom flange of the choke body.

Note. The choke assembly (105) should not be removed from the choke body (108) unless absolutely necessary. The special shim (106) is made up of a number of laminated shims 0.003 inch

thick. Once the correct shim thickness is determined, sealing compound is applied to the threads on the choke body (108) and the choke assembly (105), and the two parts, together with the shim, are assembled.

(6) The choke assembly (105) and the choke body (108) are disassembled when either part is to be replaced or when the correct thickness of the special shim (106) must be determined. The thickness of the special shim (106) must be reestablished when the upper choke (93), the ball bearing (91), the conductor housing (99), the choke assembly (105), or the choke body (108) is replaced with new parts.

(7) If the choke assembly (105) and the choke body (108) must be disassembled, perform (*a*) through (*c*) below.

(*a*) Secure the choke body portion of the assembly to prevent rotating.

(*b*) Apply heat (open flame) to the threaded junction between the choke body and the choke assembly.

(*c*) While applying heat around the threaded junction (using gloves or protective material), *apply only hand pressure* to unscrew the assembly.

Caution: **The use of handtools to separate this assembly could result in too much torque and damage to the threads or scratching of the metal surfaces.**

(8) While the man stationed at the top of the rotary joint holds the main rf transmission line section (38), have a second man at the bottom of the rotary joint remove the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (98), the twelve $\frac{1}{4}$-inch flat washers (97 and 82), the six $\frac{1}{4}$-inch lockwashers (81), and the six $\frac{1}{4}$-inch by 20 hexagonal nuts (80) that fasten the conductor housing (99) to the adapter (78). Remove the conductor housing (99), the O-ring gasket (96), and attaching parts.

(9) Remove the sleeve bearing (94) from inside the upper end of the conductor housing.

(10) Remove the retaining ring (92) from the top inside of the conductor housing (99), followed by the sleeve (95).

c. Removal and Disassembly Procedure of Adapter, Upper Choke, and Attaching Parts.

(1) Carefully lower the main rf transmission line section (38) until the top flange rests against the sleeve bearing halfset (47).

(2) Remove the four No. 10 by 24 by $\frac{5}{8}$-inch socket-head screws (88) and the four No. 10 lockwashers (89), and then remove the upper choke (93) from the main transmission line retaining flange (87).

(3) Remove the external retaining ring (90) and the ball bearing (91) from the upper choke (93).

(4) Remove the six $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (77), the six $\frac{1}{4}$-inch lockwashers (76), and the six $\frac{1}{4}$-inch flat washers (75) that hold the adapter (78) to the lower flange housing (69). Remove the adapter (78) and the rubber gasket (74).

(5) Remove the pipe-to-tube adapter (79) from the side of the adapter (78).

(6) Remove the three No. 8 by 32 by $\frac{1}{4}$-inch socket-head setscrews (84) that secure the locking nut (83) to the main transmission line retainer flange (87).

(7) Use a $1\frac{1}{4}$-inch open-end wrench on the main transmission line retainer flange (87) and a $1\frac{1}{2}$-inch open end wrench on the locknut (83) and remove the locking nut (83) and the attaching serrated locking ring (85) and the locking ring (86). Do not use pipe wrenches or pliers when disassembling these parts.

d. Removal and Disassembly Procedure of Transmission Line Sections (38), (25), and (24).

(1) Push the main rf transmission line section (38) up from the bottom of the rotary joint. Carefully pull the main rf transmission line section out through the top of the rotary joint with the IFF and reference transmission line sections inside.

Caution: **Unless absolutely necessary, do not remove the IFF and reference transmission line sections without the support of the main rf transmission line section. Because of fragility and lack of support, damage can result to these two transmission lines if removed**

without the support of the main rf transmission line section.

(2) Lay the main rf transmission line section (38) down on a flat surface and carefully remove the IFF rf transmission line section (25).

e. Removal and Disassembly of Upper Waveguide Transition.

(1) Remove the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket flathead screws (43) that fasten the upper flange housing (44) to the upper main transmission (53).

(2) Remove the 12 $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (40), the $\frac{1}{4}$-inch lockwashers (41), and the $\frac{1}{4}$-inch flat washers (42) that hold the upper flange housing (44) to the dome assembly (51).

(3) Thread the four $\frac{1}{4}$-inch by 20 by 3-inch capscrews (from special tools) into the four threaded holes around the outer edge of the upper flange housing (44). These capscrews will bottom on the flange of the dome assembly (51) and separate the upper flange housing from the dome assembly. Operate each capscrew an equal amount while raising the upper flange housing. Remove the four capscrews from the upper flange housing. Remove the O-ring gasket (45) from the upper flange housing.

(4) Remove the six 8 by 32 by $\frac{5}{8}$-inch socket, flathead, self-locking screws (49) that hold the upper bearing housing (50) to the upper main transition (53). Remove the upper bearing housing, reach in through the open end of the dome assembly (51), and remove the upper main transition (53). Remove the indium solder electrical gasket (52) from the upper main transition. This gasket is not reusable.

(5) Remove the retaining ring (46) from the upper bearing housing (50), and then remove the sleeve bearing halfset (47).

Note. The polyiron space (48) is bonded to the upper bearing housing (50) with an epoxy adhesive and is not to be removed.

f. Removal and Disassembly of Lower Waveguide Transition.

(1) Remove the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket flathead screws (70) that hold the lower flange housing (69) to the lower bearing housing (58).

(2) Remove the twelve $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (73), the $\frac{1}{4}$-inch lockwashers (72), and the $\frac{1}{4}$-inch flat washers (71) that hold the lower flange housing (69) to the waveguide transition (57).

(3) Thread the four $\frac{1}{4}$-inch by 20 by 3-inch capscrews (from special tools) into the four threaded holes around the outer edge of the lower flange housing (69). These capscrews will bottom on the flange of the waveguide transition (57) and separate the lower flange housing from the waveguide transition. Operate each capscrew an equal amount while separating these two assemblies. Remove the four capscrews from the lower flange housing. Remove the O-ring gasket (68) from the lower flange housing and the spacer ring (67).

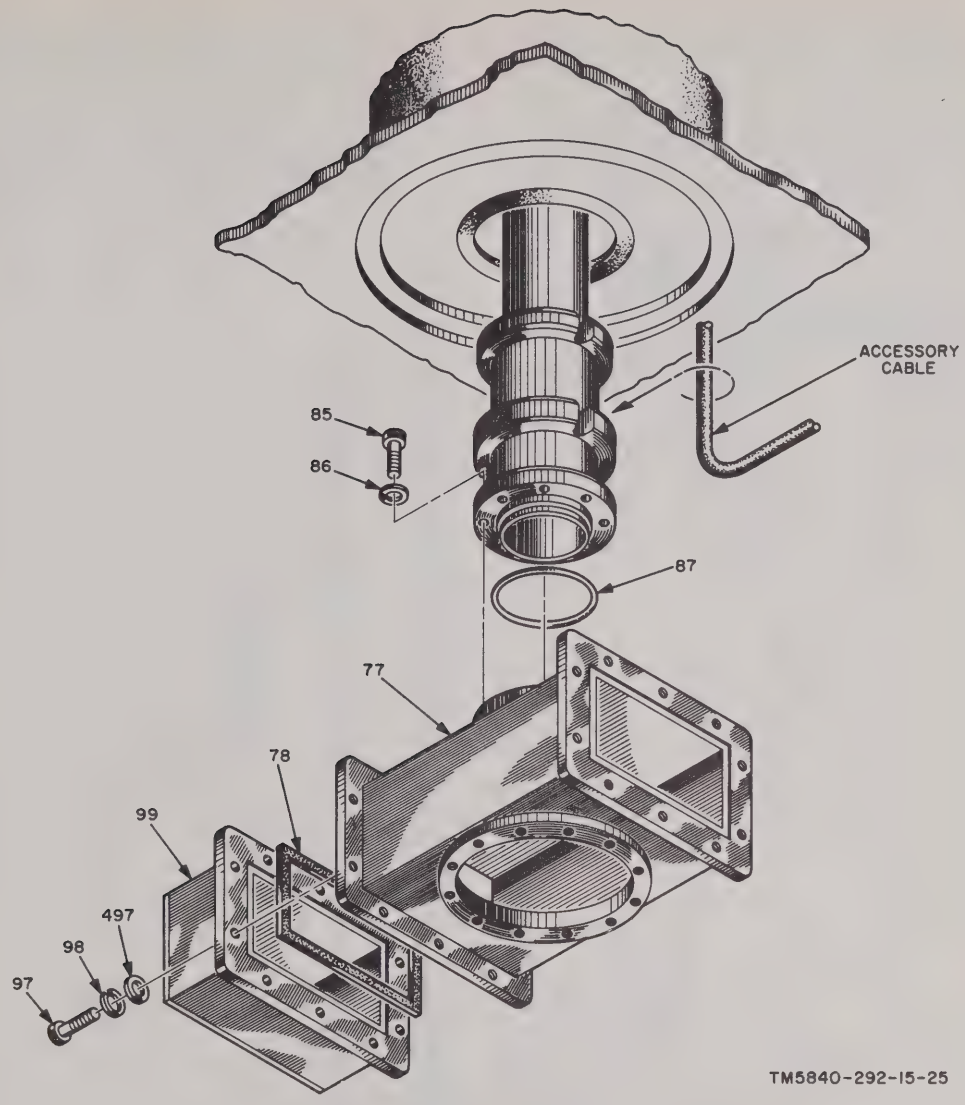
(4) Remove the six 8 by 32 by $\frac{5}{8}$-inch socket, flathead, self-locking screws (59) that hold the lower bearing housing (58) to the lower main transition (55). Remove the lower bearing housing, reach in through the open end of the waveguide transition (57), and remove the lower main transition (55). Remove the indium solder electrical gasket (56) from the lower main transition. This gasket is not reusable.

(5) Remove the retaining ring (66) from the lower bearing transition (58). The ball bearing (64) and the collar bearing (62) will come out as an assembly. Remove the positioning spacer (61) from the lower bearing housing (58).

(6) Remove the external retaining ring (65) from the collar bearing (62), and then remove the ball bearing (64). Remove the two preformed O-ring gaskets (63) from inside the collar bearing (62).

Note. The polyiron spacer (60) is fastened to the lower bearing housing (58) with an epoxy adhesive; it is not to be removed.

(7) Use a $\frac{3}{16}$-inch Allen wrench and reach in on top of the waveguide transition and remove the eight $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews and lockwashers (85 and 86, fig. 8-4), lower the waveguide



77 Waveguide transition (W857)
78 Gasket (MP825)
85 $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal socket-head capscrew
86 $\frac{1}{4}$-inch lockwasher
87 O-ring gasket (H873)
97 $\frac{5}{16}$-inch by 18 by $\frac{5}{8}$-inch hexagonal socket-head capscrew
98 $\frac{5}{16}$-inch lockwasher
99 Waveguide end section (W852)
497 $\frac{5}{16}$-inch flat washer

Figure 8–4. Antenna Pedestal AB–876/FPS–71, lower waveguide transition, exploded view.

transition (77), and remove it. Remove the O-ring gasket (87).

(8) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by $\frac{5}{8}$-inch hexagonal socket-head capscrews (97), the lockwashers (98), and the flat washers (497). Separate the waveguide end section (99) and the waveguide transition (77).

(9) Remove the gasket (78) that sealed the waveguide end section to the waveguide transition.

g. Removal of Rotary Joint Assembly. Remove the rotary joint assembly as a complete assembly and disassemble it, if necessary, on a bench. Be extremely careful when lifting the assembly from the pedestal. Lift it straight up or serious damage may result. Use a crane or other lifting device for

removing the assembly and station two men on the pedestal to guide it.

(1) Disconnect the four conductors of the accessory cable (part of the slipring assembly (collector ring), fig. 8–5) from terminals 21, 22, 23, and 24 on terminal board TB805. Remove the cable clamp screw and withdraw the accessory cable from the cable clamp. Carefully push the cable up inside the king post between the conductor tube

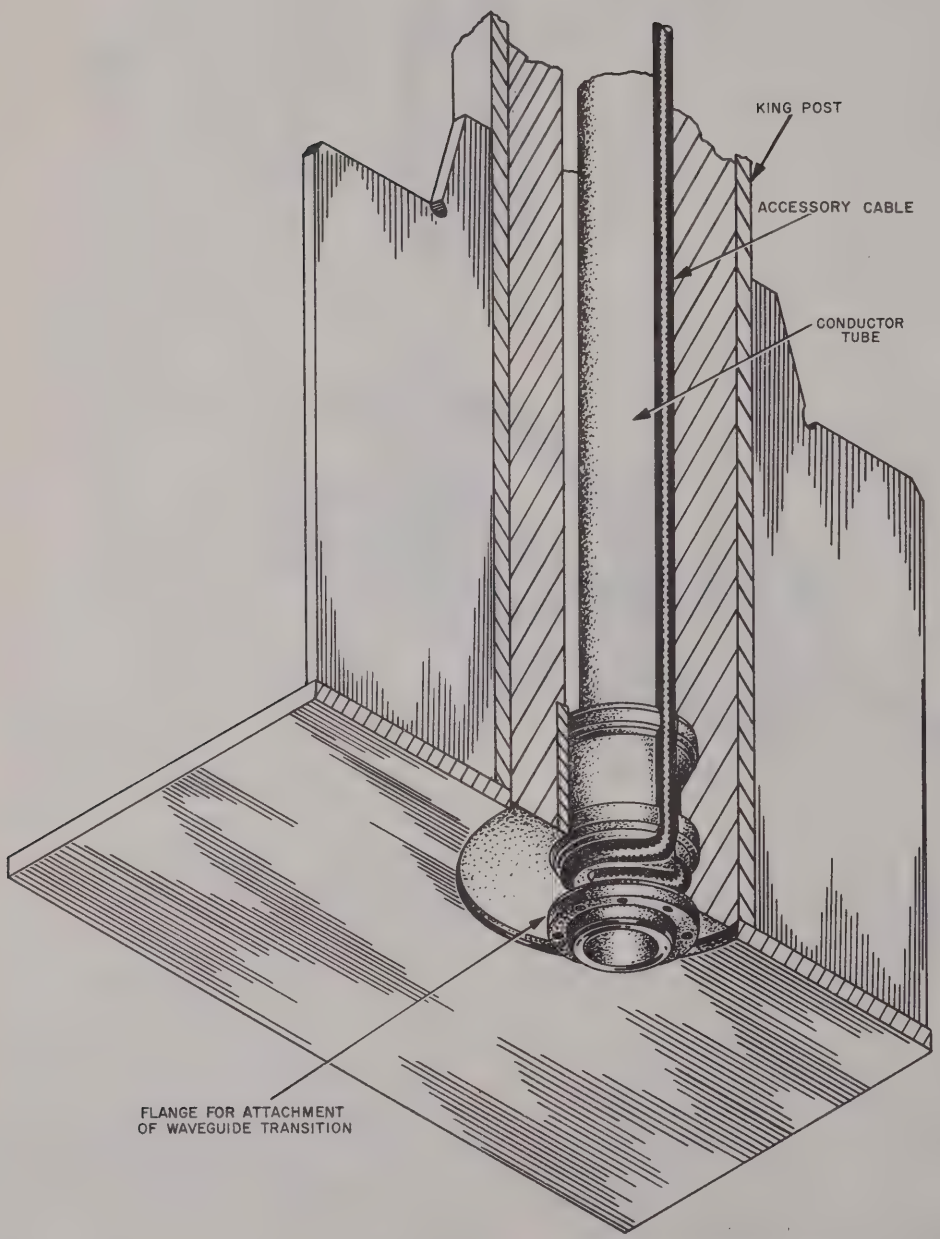


Figure 8–5. Accessory cable wrapped around conductor tube.

and the king post, leaving about 2 feet of cable. Wrap the remaining excess cable around the conductor tube above the flange to which the waveguide transition was attached (fig. 8–5). Tape the cable in place. Be sure that all of the cable is above the flange. This is necessary and important to prevent damage to the cable when the tube assembly is drawn out of the king post.

(2) If an accessory cable enters the dome assembly (105, fig. 8–6) through a threaded access adjacent to the slipring access cover (fig. 7–10) and connection is made to the slipring brush assembly contacts, perform the procedures given in (*a*) through (*c*) below. If there is no connection made to the slipring brush assembly contacts, omit the procedures given in (*a*) through (*c*) below and proceed with (3) below.

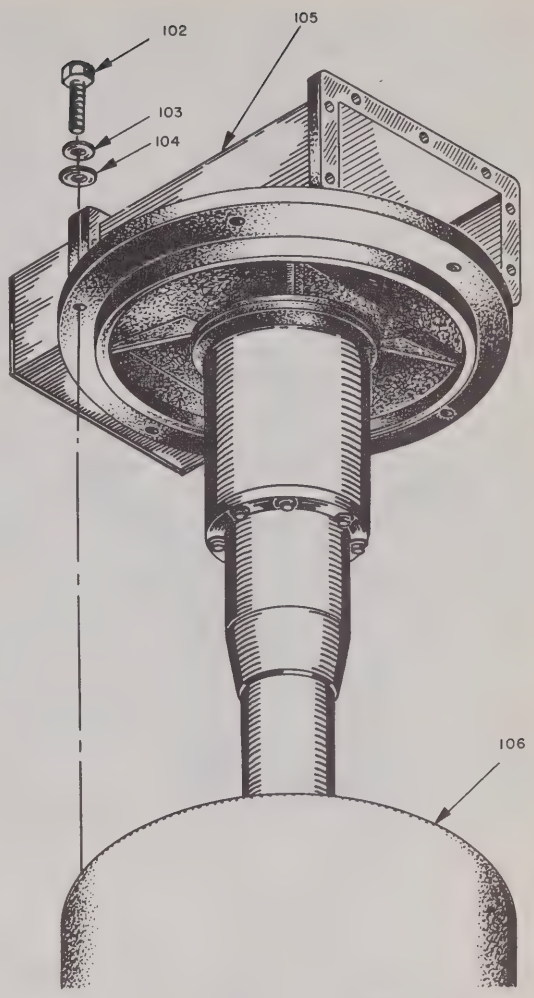
(*a*) Remove the four socket-head screws and washers (one at each corner) that hold the slipring access cover to the top of the dome assembly (105, fig. 8–6). Remove the slipring access cover and gasket.

(*b*) Tag and identify the lead connections to the slipring brush assembly contacts. Disconnect and remove the cable connections from the slipring brush assembly contacts.

(*c*) Remove the cable fitting and cable from the top of the dome assembly (105).

(3) Remove the six $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrews (102), the lockwashers (103), and the flat washers (104) that hold the dome assembly (105) to the rotor (106).

(4) Prepare a sling (preferably of web strapping) around the waveguide window assembly and the waveguide end section as shown in figure 8–7. Hook a lifting device to the sling and lift slowly and carefully. Station two men on the top of the pedestal to guide the assembly and withdraw the accessory cable as the assembly is being lifted. After the conductor tube has been lifted clear of the rotor, untape the accessory cable. Carefully remove the rotary joint assembly to a bench for disassembly.



102 $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrew
103 $\frac{5}{16}$-inch lockwasher
104 $\frac{5}{16}$-inch flat washer
105 Dome assembly (A807)
106 Rotor (A812)

Figure 8–6. Antenna Pedestal AB–876/FPS–71 rotary joint assembly removal.

h. Disassembly of Rotary Joint Assembly. Disassemble the outer conductor of the rotary joint on the bench by referring to figure 8–8, and by performing the procedures given in (1) through (5) below.

(1) Loosen and remove the eight $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal socket-head capscrews (127) and the lockwashers (128), and then remove the conductor tube (129) from the cartridge (130). Remove the

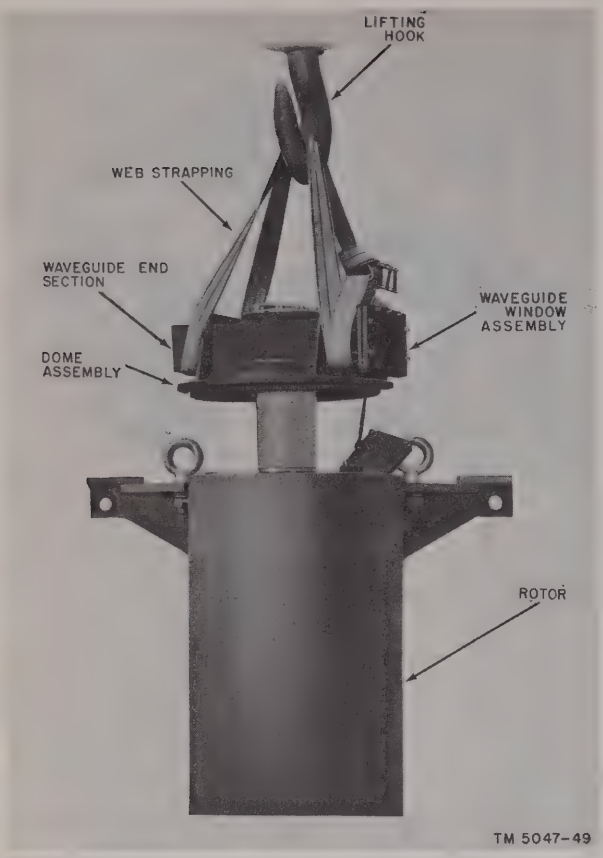


Figure 8-7. Lifting rotary joint assembly.

shim (131) and the O-ring gasket (132).

(2) Loosen and remove the eight $\frac{1}{4}$-inch by 20 by 1-inch hexagonal socket-head capscrews (133) and the lockwashers (134), and slowly remove the cartridge (130) from the ring (135). As the cartridge is being removed, the top ball bearing (136) will remain on the dome assembly shaft, held there by the retainer ring (137). However, the rest of the parts should be removed from the shaft in place in the cartridge. This is accomplished by holding down the spacer (138) with the fingers while the cartridge is being removed.

(3) Remove the parts from the cartridge as follows:

(*a*) Pull the spacer (138) from the cartridge.

(*b*) Pull the ball bearing (139) from the cartridge.

(*c*) Pull the packing ring (140) from the mating ring (141).

(*d*) Pull the mating ring (141) from the cartridge.

(*e*) Pull the oil seal (142) from the cartridge.

(4) Remove the retaining ring (137) and slide the ball bearing (136) and the ring (135) from the dome assembly shaft (105).

(5) Remove the 10 $\frac{5}{16}$-inch by 18 by $\frac{5}{8}$-inch hexagonal socket-head capscrews (143), the lockwashers (144), and the flat washers (497) that hold the waveguide end section (145) to the dome assembly (105). Remove the waveguide end section (145) and the gasket (146) from the dome assembly (105).

8-9. Removal and Disassembly of Shaft Seal Assembly Holder

(fig. 8-9)

a. Removal of Azimuth Scale, Seal Retainer Halves, and Bellow Retainer Halves.

(1) Make a reference mark on the azimuth scale and the rotor assembly for use as a guide in reassembly.

(2) Loosen and remove the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{8}$-inch hexagonal-head capscrews (147), the flat washers (148), the lockwashers (149), and the nuts (150) that hold the azimuth scale halves (151 and 152) to the rotor assembly. Remove the azimuth scale halves (151 and 152).

105 Dome assembly (A807)
127 $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal socket-head capscrew
128 $\frac{1}{4}$-inch lockwasher
129 Conductor tube (E852)
130 Cartridge (A803)
131 Shim (MP806)
132 O-ring gasket (H875)
133 $\frac{1}{4}$-inch by 20 by 1-inch hexagonal socket-head capscrew
134 $\frac{1}{4}$-inch lockwasher
135 Ring (MP820)
136 Ball bearing (MP1860)
137 Retainer ring (H812)
138 Spacer (MP821)
139 Ball bearing (MP808)
140 Packing ring (MP1889)
141 Mating ring (MP1888)
142 Oil seal (MP1387)
143 $\frac{5}{16}$-inch by 18 by $\frac{5}{8}$-inch hexagonal socket-head capscrew
144 $\frac{5}{16}$-inch lockwasher
145 Waveguide end section (W851)
146 Gasket (MP823)
497 $\frac{5}{16}$-inch flat washer

Figure 8-8. Antenna Pedestal AB-876/FPS-71 rotary joint assembly, exploded view.

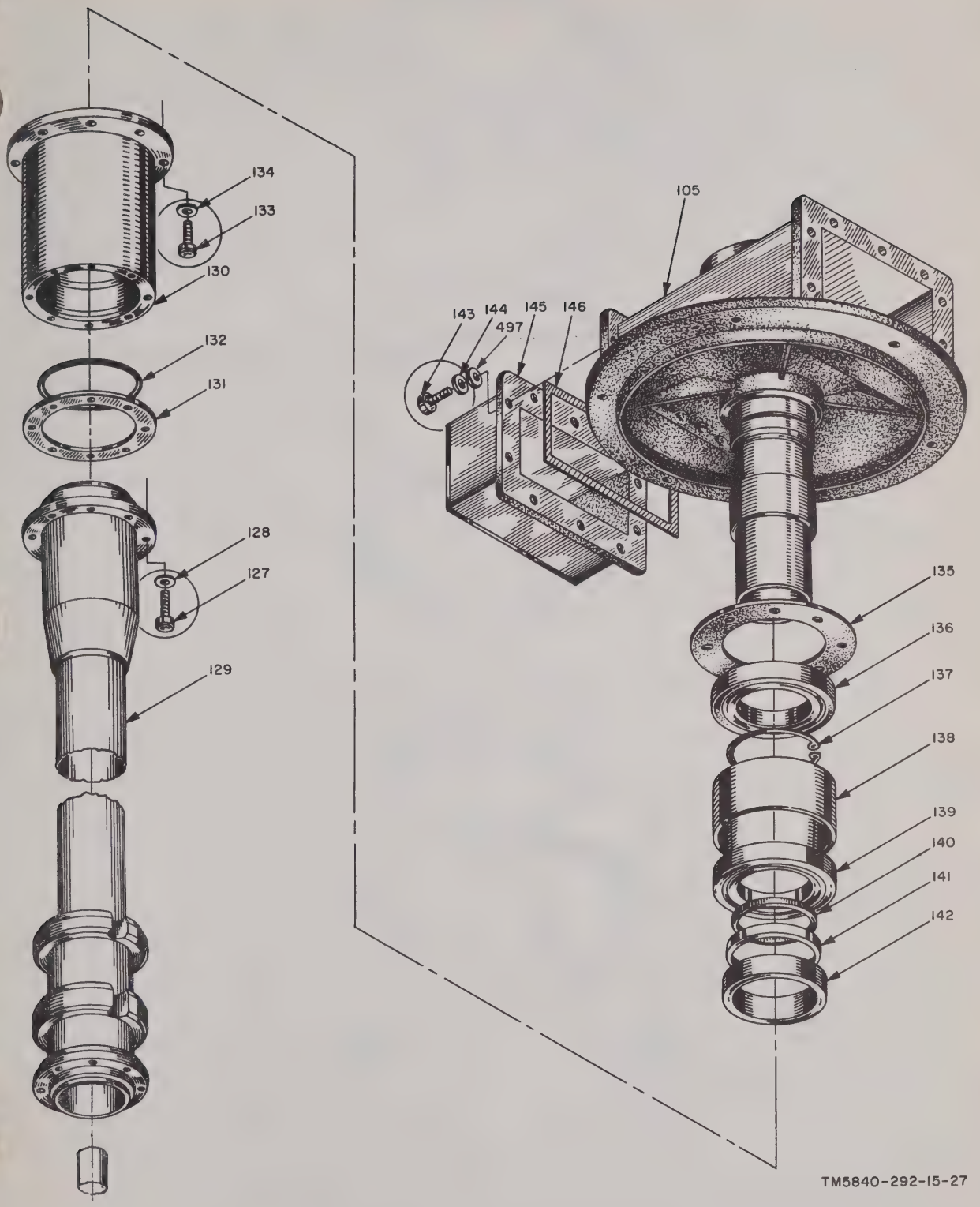


Figure 8-8.—Continued

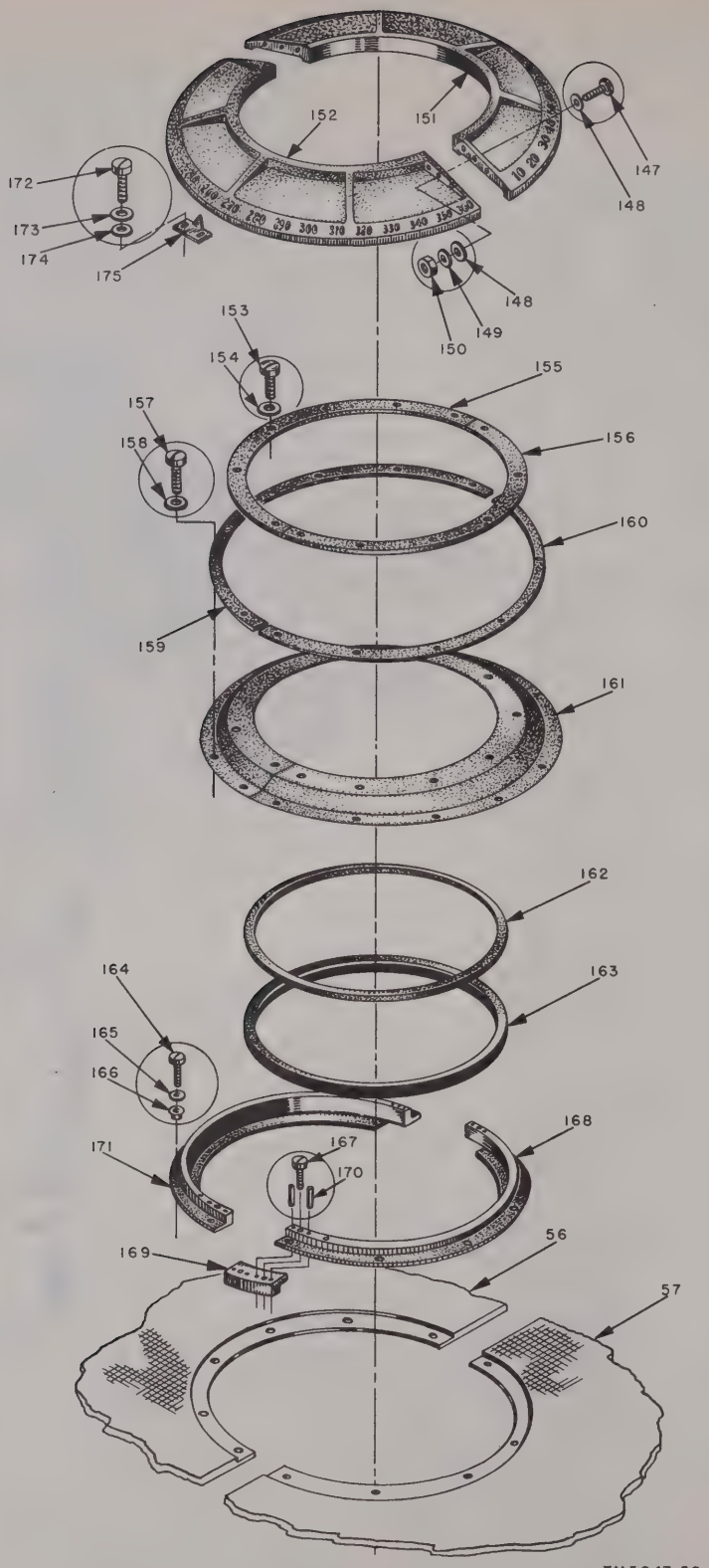


Figure 8-9. Shaft seal assembly holder, exploded view.

56 Pedestal cover half section (A845)
57 Pedestal cover half section (A853)
147 ¼-inch by 20 by 1⅛-inch hexagonal-head capscrew
148 ¼-inch flat washer
149 ¼-inch lockwasher
150 ¼-inch by 20 hexagonal nut
151 Azimuth scale half (MP1896)
152 Azimuth scale half (MP851)
153 ¼-inch by 20 by ⅞-inch hexagonal-head capscrew
154 ¼-inch lockwasher
155 Seal retainer half (A825)
156 Seal retainer half (A824)
157 ¼-inch by 20 by ⅝-inch hexagonal-head capscrew
158 ¼-inch lockwasher
159 Bellows retainer half (MP854)
160 Bellows retainer half (MP853)
161 Bellows (MP855–1, MP855–2)
162 Felts (MP1894)
163 Oil seal (MP1898)
164 ¼-inch by 20 by ¾-inch hexagonal-head capscrew
165 ¼-inch lockwasher
166 Inserts (H851)
167 ¼-inch by 20 by 1-inch fillister-head machine screw
168 Seal holder half (A822)
169 Seal holder plates (MP857, MP858)
170 Dowel pins (H843, H850)
171 Seal holder half (A823)
172 ¼-inch by 20 by ⅞-inch hexagonal-head capscrew
173 ¼-inch lockwasher
174 ¼-inch flat washer
175 Pointer (MP862)

Figure 8–9.—Continued

(3) Loosen and remove the twelve ¼-inch by 20 by ⅞-inch hexagonal-head capscrews (153) and the lockwashers (154), and then remove the seal retainer halves (155 and 156).

(4) Loosen and remove the twelve ¼-inch by 20 by ⅝-inch hexagonal-head capscrews (157) and the lockwashers (158), and then remove the bellows retainer halves (159 and 160).

b. Removal of Shaft Seal Assembly Holder and Cover Half Sections.

(1) Slide the bellows (161) up onto the rotor assembly as far as possible and secure it with tape or string. The bellows can be removed after the rotor assembly has been dismounted from the pedestal and disassembled. This procedure eliminates breaking the bellows halves apart and recementing them when the unit is reassembled.

(2) Remove the felt halves (162), one at a time, from the shaft seal assembly holder.

(3) Remove the oil seal (163) from the shaft seal assembly holder by lifting out, spreading at the split, and pulling from the rotor assembly.

(4) Loosen and remove the four ¼-inch by 20 by ¾-inch hexagonal-head capscrews (164), the lockwashers (165), and the inserts (166) that attach the shaft seal assembly holder to the pedestal cover half sections.

(5) Loosen and remove the four ¼-inch by 20 by 1-inch fillister-head machine screws (167) that attach the seal holder halves (168) to the seal holder plates (169). Remove only one screw from each seal holder half section to prevent the plates from dropping down into the pedestal. Lift the seal holder halves from the pedestal. Remove the other two fillister-head screws to dismount the plates.

(6) Loosen and remove the two ¼-inch by 20 by ⅞-inch hexagonal-head capscrews (172), the lockwashers (173), and the flat washers (174), and then remove the pointer (175) from the cover half sections.

(7) Lift the pedestal cover half sections (56 and 57) from the pedestal.

8–10. Removal of Distribution Box
(fig. 8–2)

a. Remove the large cover on the front of the distribution box (53) and disconnect the wiring that connects the distribution box to the pedestal wiring system.

(1) Disconnect the four conductors of the drive motor cable from the motor protector fuse block and the grounding terminal (fig. 7–1).

(2) Disconnect the three conductors of the heater cable from terminals X7B, X8B, and X9B on terminal board TB802.

(3) Disconnect the conductors of the control circuit cable from the terminals on terminal boards TB801, TB802, TB803, and TB804.

(4) Disconnect the conductors of the synchro cable from the terminals on terminal boards TB803 and TB804.

(5) Loosen the locknuts and dismount the three stuffing tubes from the back of the distri-

bution box and the one stuffing tube from the bottom of the distribution box.

b. While holding the distribution box (53) upright, remove the three $\frac{3}{8}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrews (49), the lockwashers (48), and the flat washers (47) that secure the mounting bracket (55) to the base frame. Dismount the distribution box with its mounting bracket.

8–11. Removal of Drip Pan
(figs. 8–10—8–14)

a. Disconnect the synchonizing switch cable from terminals 8A14 and 8A15 of terminal board TB805. Remove the three 10 by 24 by $\frac{3}{4}$-inch binder-head machine screws (177), the flat washers (178), and the lockwashers (179) and dismount the synchronizing switch (176) and the cable from the switch bracket (180).

b. Dismount the tube support (224, fig. 8–14) from the support block (182, fig. 8–10). Loosen the compression nut on the tube union (228, fig. 8–14) and remove the upper oil tube section (223).

c. Loosen and remove the two $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch binder-head machine screws (187, fig. 8–10), the lockwashers (188), and flat washers (189) and dismount the switch bracket (180) from the drip pan.

d. Dismount the oil splash ring (191) from the pinion gear (192) by loosening the two setscrews (190) in the oil splash ring.

e. Loosen the two setscrews (194 and 195) in the pinion gear and pull the pinion gear (192) and the key (193) off the speed reducer shaft.

f. Rotate the main drive gear (468, fig. 8–26) manually until one of the round holes is directly over the joint between drip pan section MP874 (181, fig. 8–10) and drip pan section MP875 (198). Reach through the hole and remove the three $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews (199), the flat washers (200), the lockwashers (201), and the hexagonal nuts (202).

g. Unscrew the female Alemite fitting (fig. 8–11) and withdraw the male connector from the bracket.

h. Remove the $\frac{5}{16}$-inch by 18 hexagonal nut, the lockwasher, and the flat washer that hold the bracket to the drip pan section (MP869) as shown in figure 8–11. Remove the bracket.

i. Loosen and remove the $\frac{5}{16}$-inch by 18 by $1\frac{3}{4}$-inch hexagonal-head capscrew (fig. 8–11), the five $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrews (206, fig. 8–12), the lockwashers (207), and the flat washers (208) that fasten drip pan sections MP874 and MP869 (181 and 210) together.

j. Loosen and remove the six $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch hexagonal-head capscrews (211), the lockwashers (212), and the flat washers (213) that fasten drip pan sections MP872 and MP869 (209 and 210) together.

k. Loosen and remove the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (215), the lockwashers (216), and the flat washers (217) that attach drip pan section MP869 (210) to the angle brackets (214). Remove drip pan section MP869 from the pedestal.

l. Loosen and remove the six $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrews (206), the lockwashers (207), and the flat washers (208) that join the drip pan sections (181 and 209).

m. Loosen and remove the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (215), the lockwashers (216), and the flat washers (217) that attach drip pan section MP872 (209) to the angle bracket (214). Remove drip pan section MP872 from the pedestal.

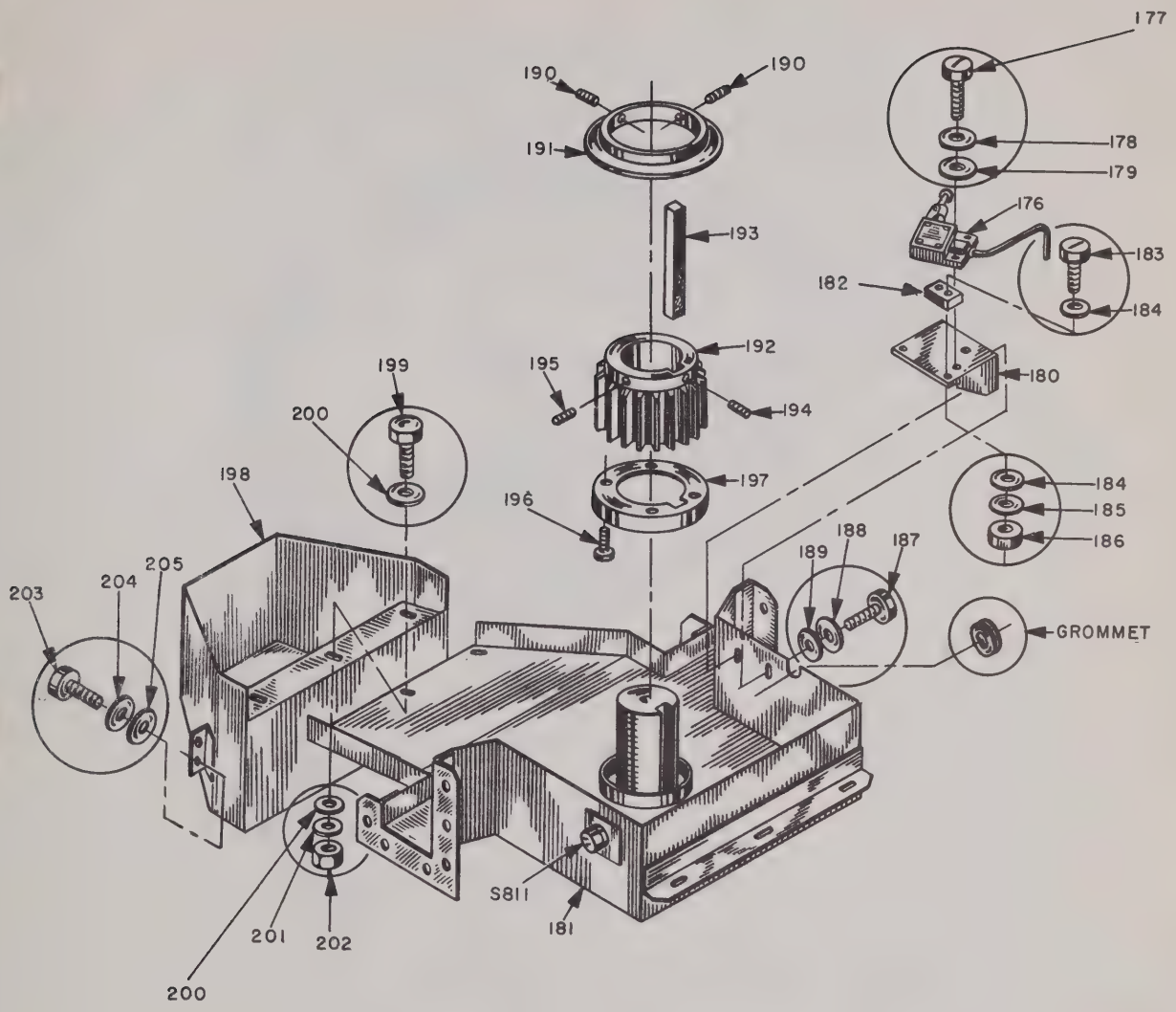
n. Before disassembling the oil return line, the insulating wrapping and heating cables HR815 and HR816 must be dismounted (fig. 8–13).

(1) Separate plugs P804 and P805 from jacks J804 and J805.
(2) Remove the three hose clamps (3) that secure the heating coils and the insulating wrapping. Carefully unwrap and coil the insulating wrapping.
(3) Loosen the turns of heating cables HR815 and HR816 back along the pipe and carefully separate the pipes from the coils, leaving the heating cable coiled loosely.

o. Starting at the pipe union (240, fig. 8–14), disassemble and remove the parts of the oil return line (234 through 244) between drip pan section MP875 and the lubrication oil sump.

p. Disassemble the parts of the oil sump supply tube (229 through 233) between the tube union (228) on drip pan section MP874 (181) and the lubrication oil sump. If necessary, dismount the tube union from drip pan section MP874.

q. Loosen and remove the four $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews (203, fig. 8–10), the lockwashers (204), and the flat washers (205), and dismount drip pan section MP875 (198) from the king post.



TM5047-53

176 Synchronizing switch (S802)
177 10 by 24 by $\frac{3}{4}$-inch binder-head machine screw
178 No. 10 lockwasher
179 No. 10 flat washer
180 Switch bracket (A886)
181 Drip pan section (MP874)
182 Support block
183 10 by 24 by $\frac{3}{4}$-inch binder-head machine screw
184 No. 10 flat washer
185 No. 10 lockwasher
186 10 by 24 hexagonal nut
187 $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch hexagonal-head capscrew
188 $\frac{1}{4}$-inch lockwasher
189 $\frac{1}{4}$-inch flat washer
190 $\frac{1}{4}$-inch by 20 by $\frac{5}{16}$-inch setscrew
191 Oil splash ring (MP1864)
192 Pinion gear (MP865)
193 Key (MP11817)
194 $\frac{1}{4}$-inch by 13 by $\frac{3}{8}$-inch setscrew
195 $\frac{1}{4}$-inch by 13 by $\frac{7}{8}$-inch setscrew
196 $\frac{1}{4}$-inch by 20 by $\frac{1}{2}$-inch binder-head machine screw
197 Ring (MP866)
198 Drip pan section (MP875)
199 $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrew
200 $\frac{1}{4}$-inch flat washer
201 $\frac{1}{4}$-inch lockwasher
202 $\frac{1}{4}$-inch by 20 hexagonal nut
203 $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrew
204 $\frac{5}{16}$-inch lockwasher
205 $\frac{5}{16}$-inch flat washer

Figure 8-10. Drip pan assembly and related parts, exploded view.

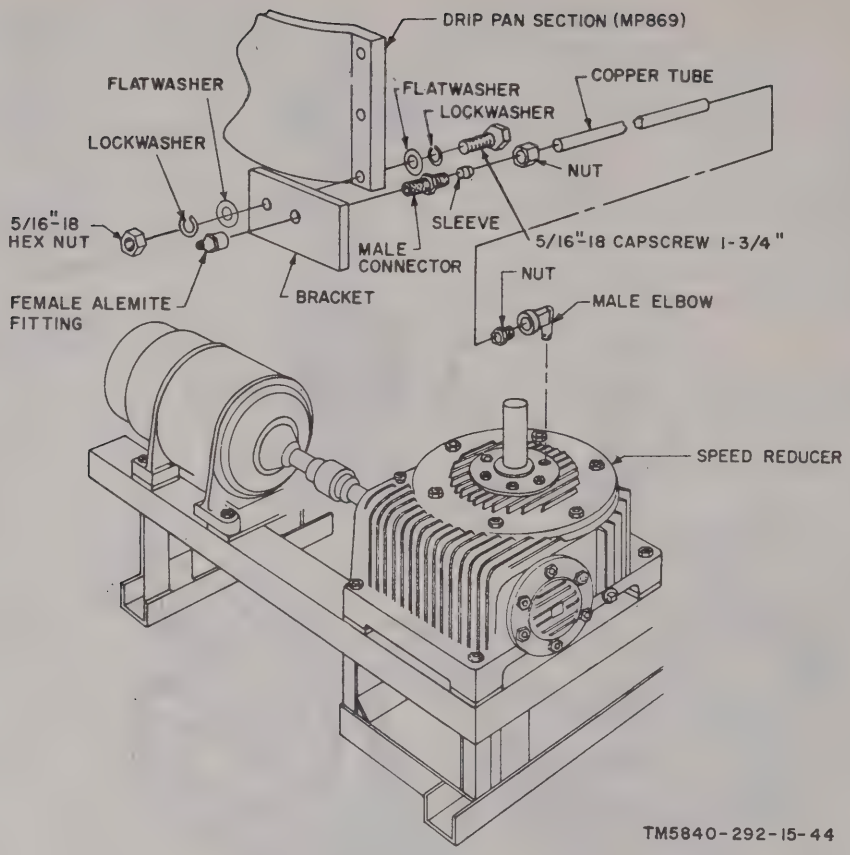


Figure 8–11. Speed reducer extended grease fitting, exploded view.

181 Drip pan section (MP874)
198 Drip pan section (MP875)
206 $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrew
207 $\frac{5}{16}$-inch lockwasher
208 $\frac{5}{16}$-inch flat washer
209 Drip pan section (MP872)
210 Drip pan section (MP869)
211 $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch hexagonal-head capscrew
212 $\frac{5}{16}$-inch lockwasher
213 $\frac{5}{16}$-inch flat washer
214 Angle bracket (A839)
215 $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrew
216 $\frac{5}{16}$-inch lockwasher
217 $\frac{5}{16}$-inch flat washer
218 $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrew
219 $\frac{5}{16}$-inch flat washer
220 $\frac{5}{16}$-inch lockwasher
221 $\frac{5}{16}$-inch by 18 hexagonal nut

Figure 8–12. Drip pan sections, exploded view.

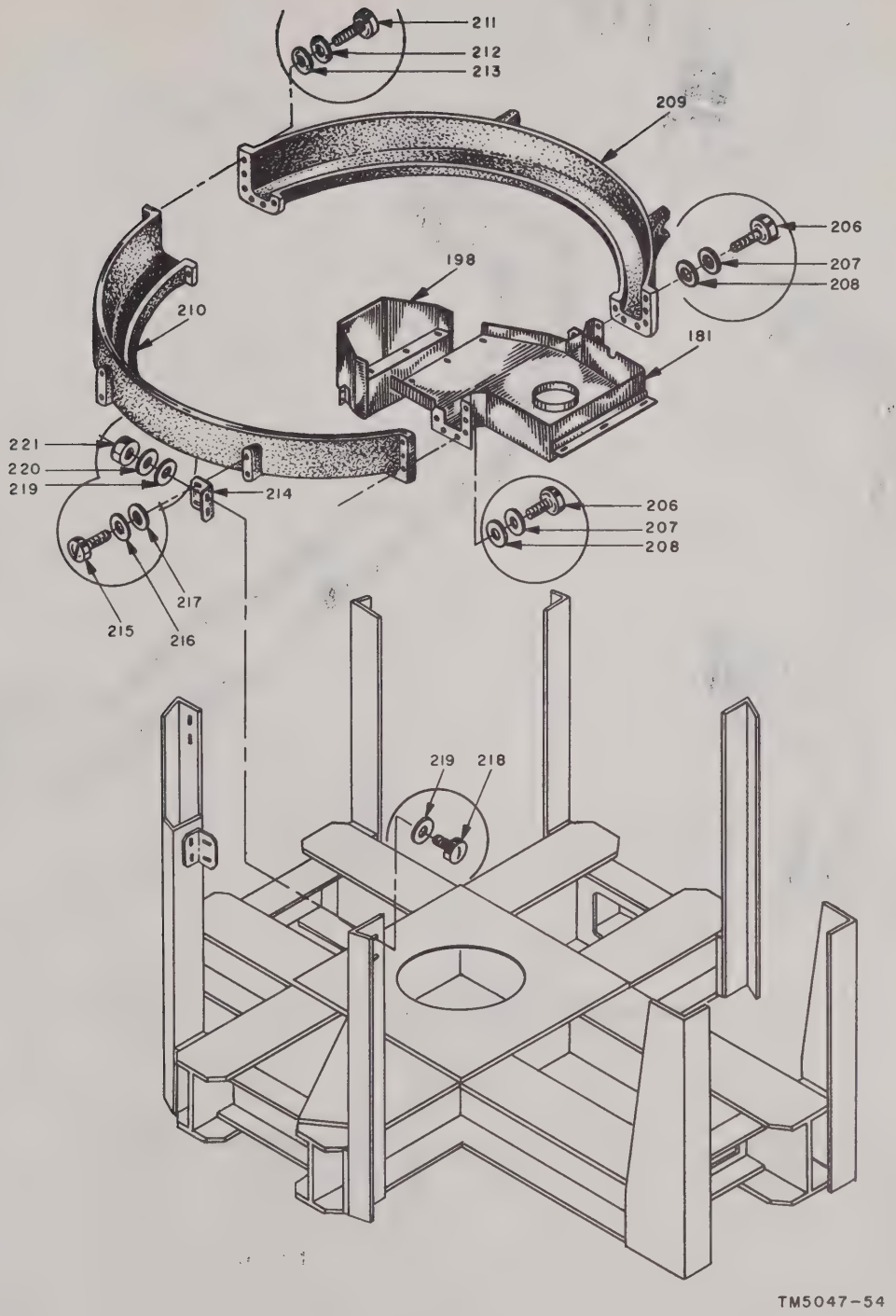


Figure 8-12.—Continued

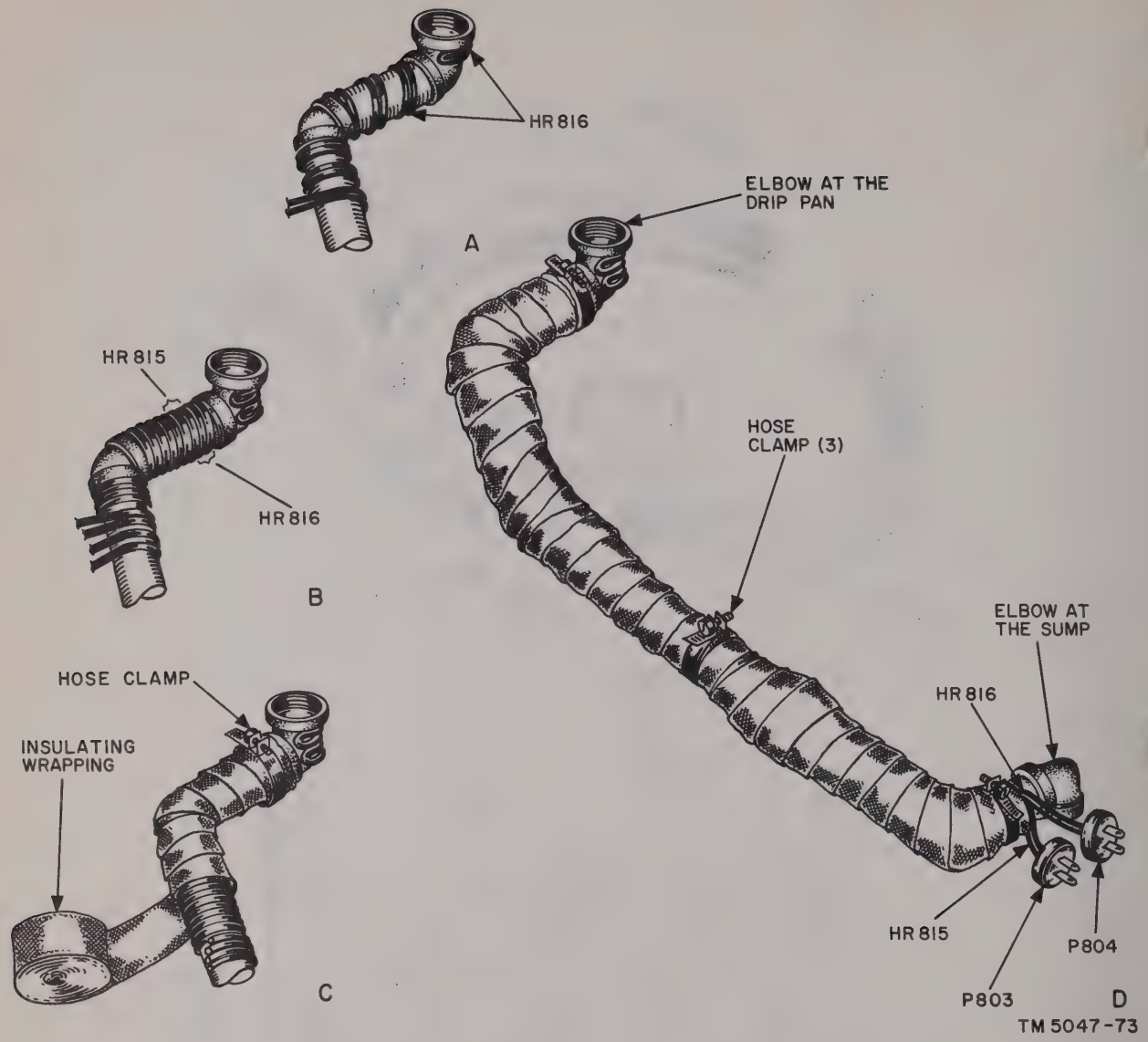


Figure 8-13. Lubricating oil supply return line, heater and insulator wrapping.

181 Drip pan section (MP874)
222 Tube reducer (MP1844)
223 Upper oil tube section
224 Tube support
225 Binder-head machine screw
226 Lockwasher
227 Flat washer
228 Tube union
229 Oil supply tube
230 Tube coupling
231 Oil supply tube
232 Elbow (MP1837)
233 Pipe-to-tube adapter (MP1840)
234 Elbow (MP1832)
235 Pipe (MP1840)
236 Elbow (MP1834)
237 Pipe (MP1839)
238 Elbow (MP1835)
239 Pipe (MP1838)
240 Pipe union (MP11822)
241 Pipe (MP1837)
242 Elbow (MP1841)
243 Pipe (MP1836)
244 Elbow (MP1833)

Figure 8-14. Lubricating oil supply and return lines.

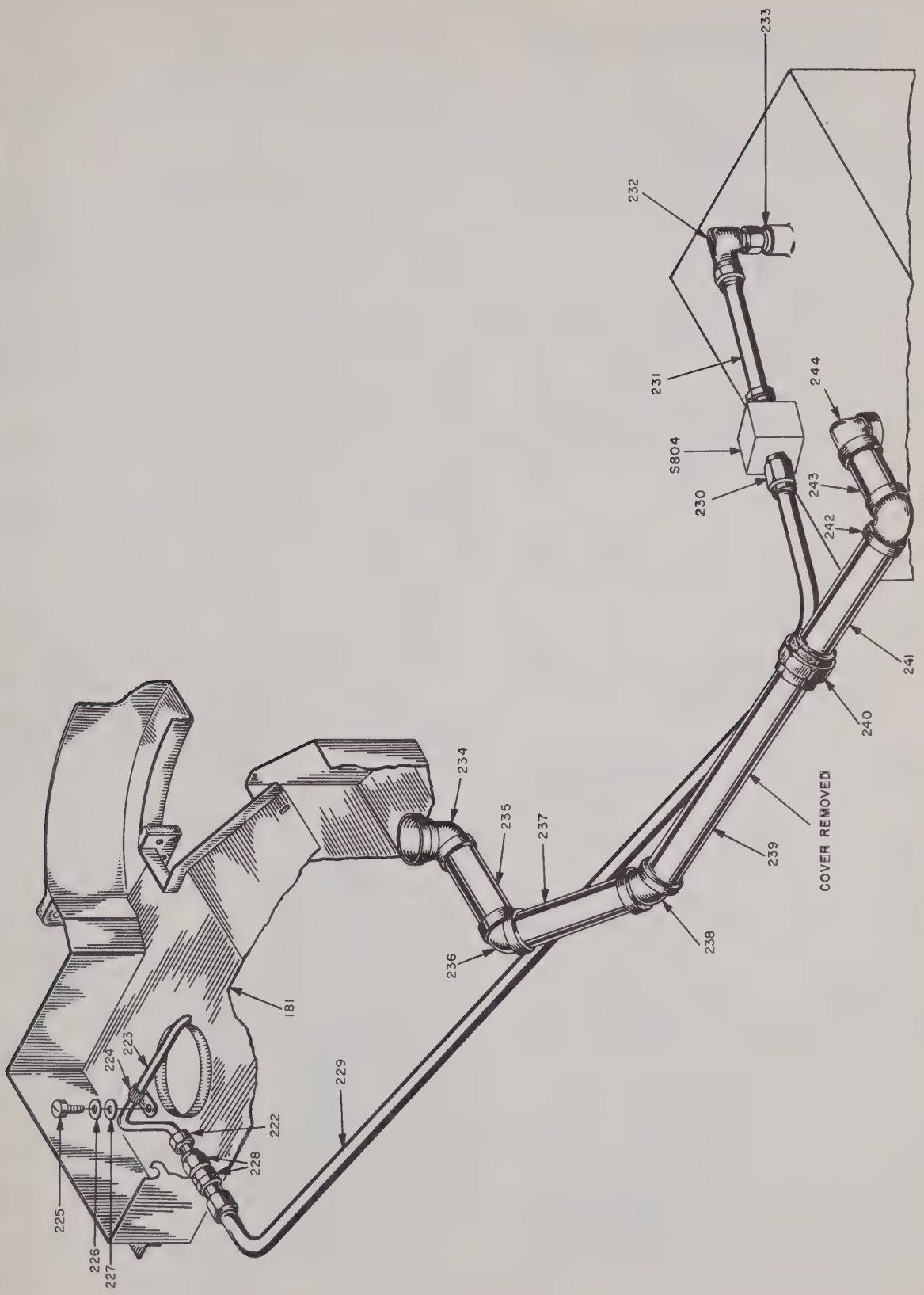


Figure 8-14.—Continued

8–12. Removal of Angle Brackets and Unit Heater Z815 from Base Frame
(fig. 8–15)

a. Loosen and remove the thirty-two $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrews (245), the 64 flat washers (246), the 32 lockwashers (247), and the hexagonal nuts (248), and dismount the 8 angle brackets (249 through 256) from the base frame (358).

b. Loosen and remove the four $\frac{3}{8}$-inch by 16 by $\frac{3}{4}$-inch hexagonal-head capscrews (257), the lockwashers (258), and the flat washers (259), and dismount the unit heater (260) from the vibration mounts (268).

c. Loosen and remove the six $\frac{3}{8}$-inch by 16 by $1\frac{1}{2}$-inch hexagonal-head capscrew (261), the lockwashers (262), and the flat washers (263), and then remove the heater mounting plate (264) from the base frame (358).

d. Remove the vibration mounts (268) from the heater mounting plate (264) by loosening and removing the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch flathead machine screws (265), the lockwashers (266), and the hexagonal nuts (267).

8–13. Removal and Disassembly of Dry-Air Pressure System
(fig. 8–16)

Note. Be sure to disconnect the dry-air cylinder (if used) or shut off the air supply line from the parent radar set before removal and disassembly of the dry-air pressure system.

a. Disconnect the pressure switch cable from terminal board TB805.

b. Disconnect and remove the air line from the parent radar set from the pipe-to-flare tube fitting (278).

c. Loosen and remove the two $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch hexagonal head capscrews (269), the lockwashers (270), and the flat washers (271), and then remove the dry-air pressure system from the base frame (358, fig. 8–15) as a unit.

d. Loosen the gland nut (272, fig. 8–16) and remove the flexible dry airhose (273) from the elbow (274).

e. Remove the elbow (274) from the tee (275).

f. Remove the pressure gage (276), the relief valve (277), and the pipe-to-flare tube fitting (278) from the cross fitting (279).

g. Remove the cross fitting (279) and the coupling nipple (280) from the tee (275).

h. Remove the tee (275), the coupling nipple (281), and the bushing (282) from the pressure switch (283).

8–14. Removal of Drive Motor

a. With a suitable tool, remove the snaprings followed by the seals on each end of the shaft coupling (fig. 8–17) and leave them on the shaft. Slide the sleeve off the hubs toward the drive motor.

b. Loosen and remove the four $\frac{1}{2}$-inch by 13 by 4-inch hexagonal-head capscrews (284), the eight flat washers (285), four lockwashers (286), and the hexagonal nuts (287), and dismount the motor from the motor and speed reducer base (291).

c. Slide the sleeve of the shaft coupling off over the hub attached to the motor shaft (fig. 8–17). If necessary, the hubs, snaprings, keys, and seals may be removed by loosening the two setscrews on each hub and gently driving the hub from the shaft.

8–15. Removal of Speed Reducer

a. Drain the oil from the speed reducer as directed in paragraph 5–9.

b. Disconnect speed reducer heater HR810 (329, fig. 8–19) and thermal switch S806 (304).

c. Loosen and remove the four $\frac{7}{8}$-inch by 9 by 5-inch hexagonal-head capscrews (295, fig. 8–18), the eight flat washers (296), the four lockwashers

245 $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrew
246 $\frac{5}{16}$-inch flat washer
247 $\frac{5}{16}$-inch lockwasher
248 $\frac{5}{16}$-inch by 18 hexagonal nut
249 Angle bracket (A857)
250 Angle bracket (A856)
251 Angle bracket (A833)
252 Angle bracket (A836)
253 Angle bracket (A834)
254 Angle bracket (A837)
255 Angle bracket (A835)
256 Angle bracket (A838)
257 $\frac{3}{8}$-inch by 16 by $\frac{3}{4}$-inch hexagonal-head capscrew
258 $\frac{3}{8}$-inch lockwasher
259 $\frac{3}{8}$-inch flat washer
260 Unit heater (Z815)
261 $\frac{3}{8}$-inch by 16 by $1\frac{1}{2}$-inch hexagonal-head capscrew
262 $\frac{3}{8}$-inch lockwasher
263 $\frac{3}{8}$-inch flat washer
264 Heater mounting plate (A893)
265 $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch flathead machine screw
266 $\frac{5}{16}$-inch lockwasher
267 $\frac{5}{16}$-inch by 18 hexagonal nut
268 Vibration mount (MP1849)
358 Base frame (A813)

Figure 8–15. Angle brackets and unit heater mounting, exploded view.

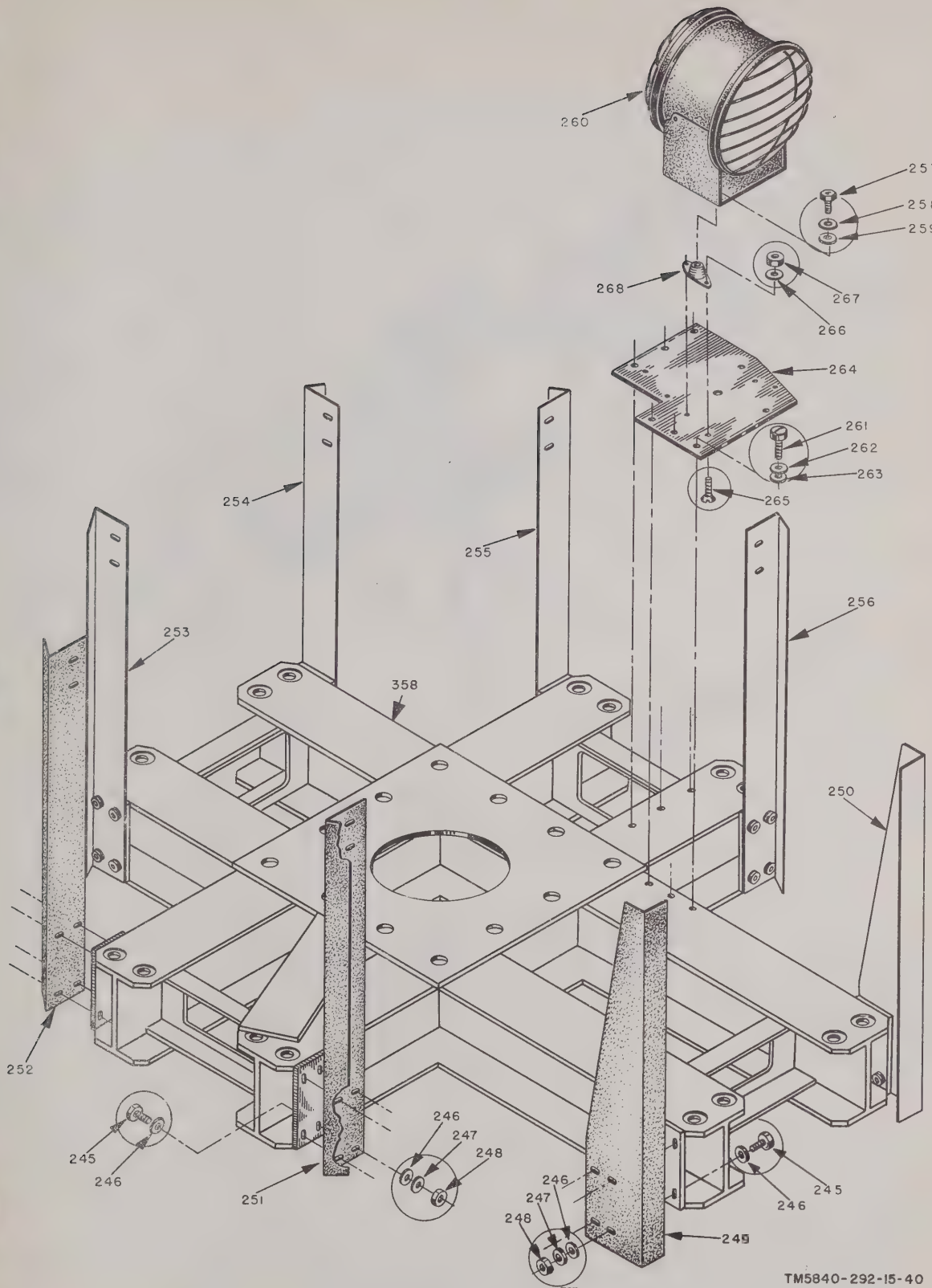
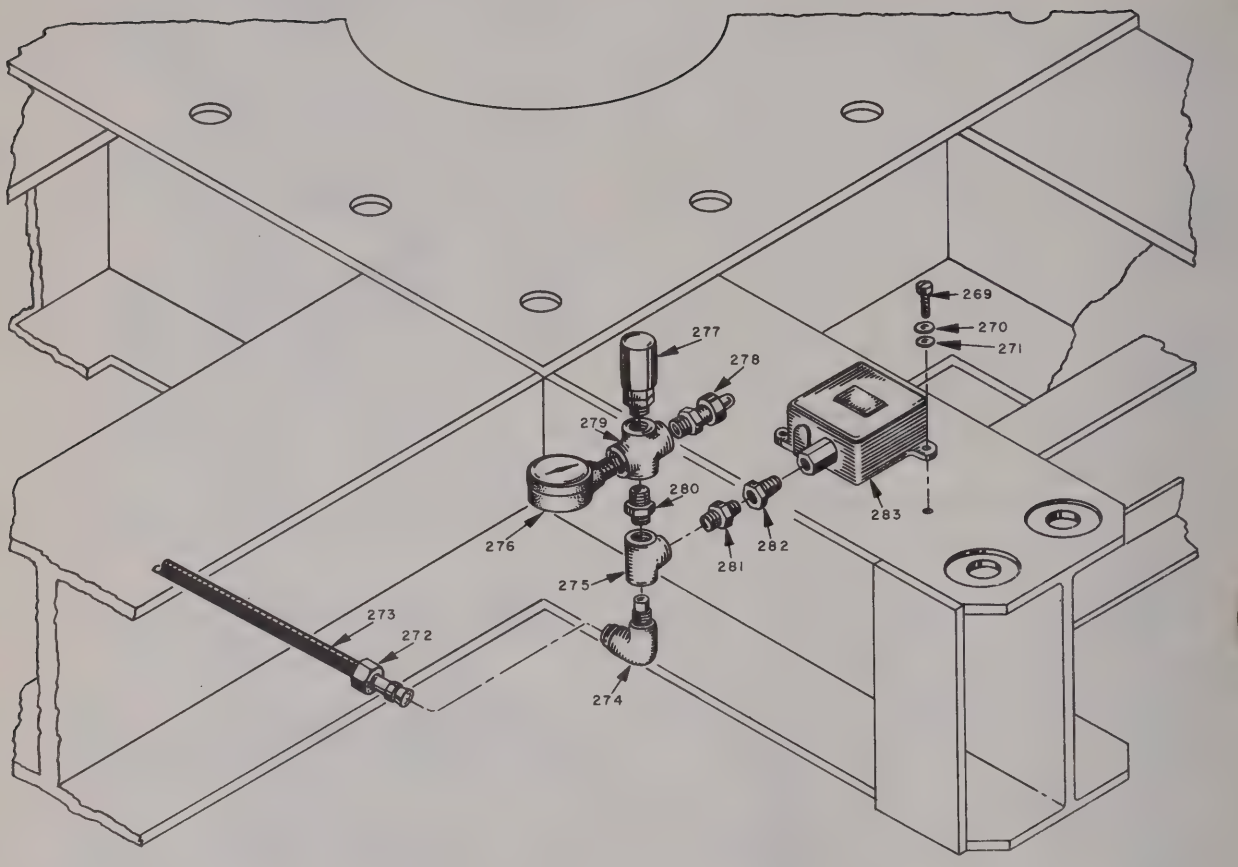


Figure 8–15.—Continued



269 ¼-inch by 20 by 1¼-inch hexagonal-head capscrew
270 ¼-inch lockwasher
271 ¼-inch flat washer
272 Gland nut
273 Flexible dry airhose (MP1863)
274 Elbow (MP1818)
275 Tee (MP1819)
276 Pressure gage (M850)
277 Relief valve (MP1826)
278 Pipe-to-flare tube fitting
279 Cross fitting (MP1823)
280 Coupling nipple (MP1821)
281 Coupling nipple (MP1822)
282 Bushing (MP1820)
283 Pressure switch (S805)

Figure 8–16. Dry-air pressure system, exploded view.

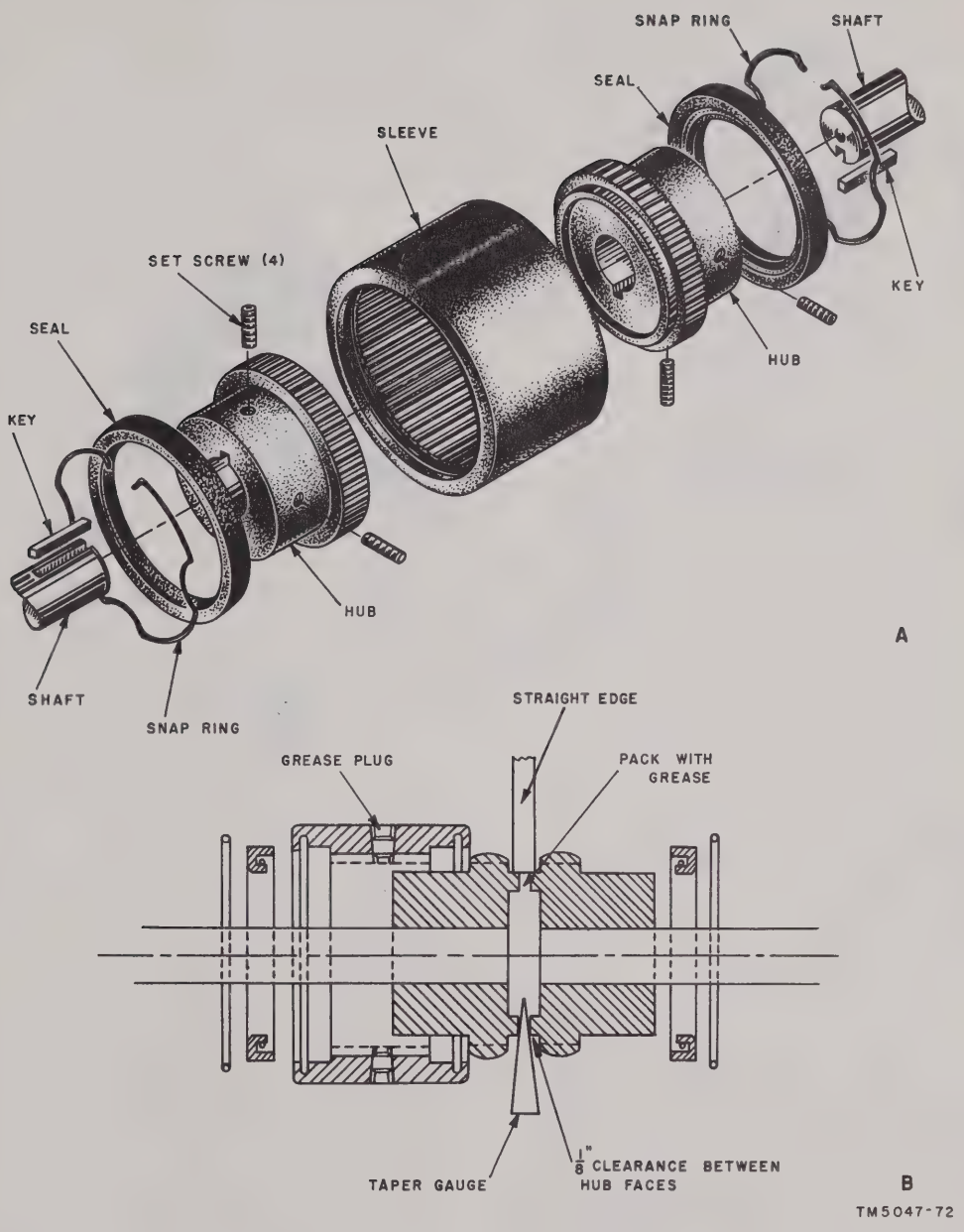
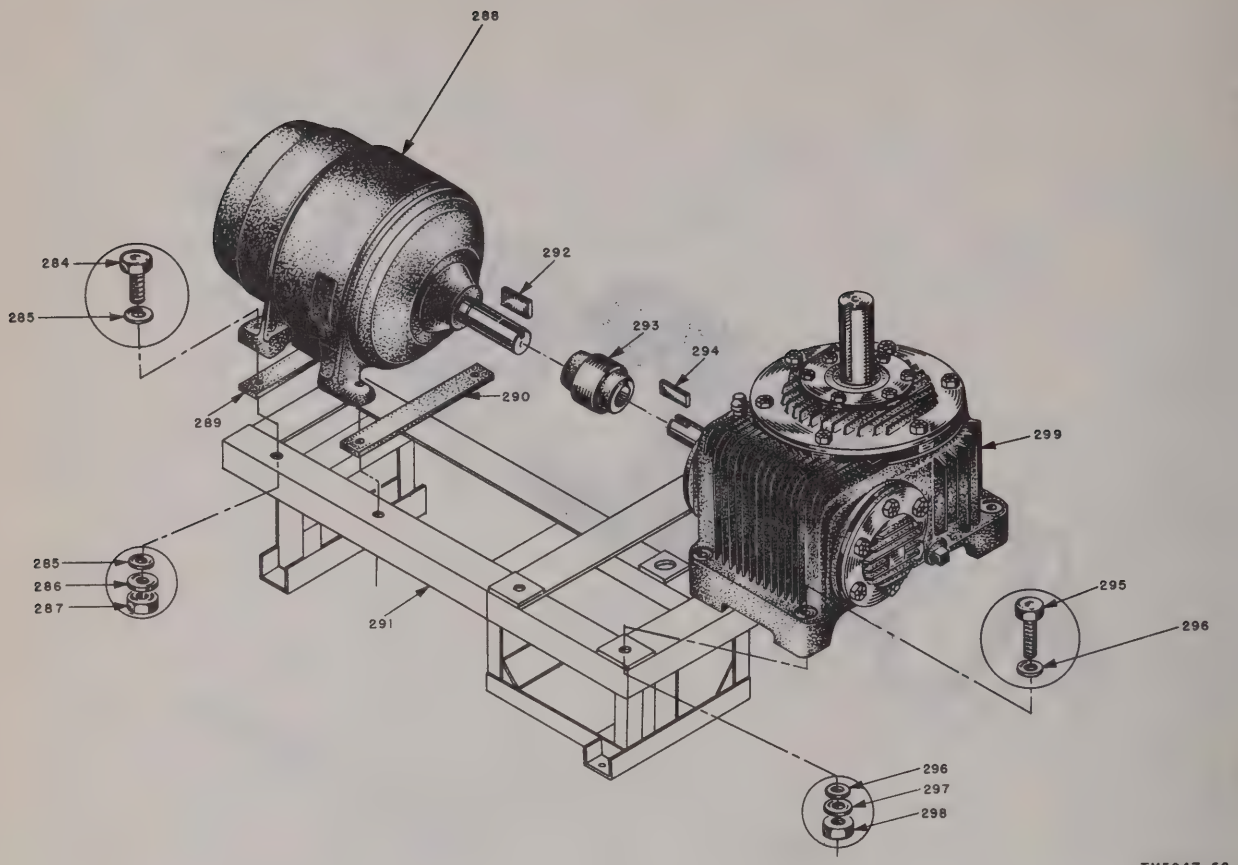


Figure 8-17. Shaft coupling MP863.



284 ½-inch by 13 by 4-inch hexagonal-head capscrew
285 ½-inch flat washer
286 ½-inch lockwasher
287 ½-inch by 13 hexagonal nut
288 Driver motor (B801)
289 Mounting plate (MP868)
290 Mounting plate (MP869)
291 Motor and speed reducer base (A826)
292 Key
293 Shaft coupling (MP863)
294 Key
295 ⅞-inch by 9 by 5-inch hexagonal-head capscrew
296 ⅞-inch flat washer
297 ⅞-inch lockwasher
298 ⅞-inch by 9 hexagonal nut
299 Speed reducer (MP864)

Figure 8–18. Motor and speed reducer mounting, exploded view.

(297), and the hexagonal nuts (298), and then remove the speed reducer (299) and drip pan section MP874 from the pedestal. Lift drip pan section MP874 from the speed reducer.

d. Loosen the nut that screws into the male elbow (fig. 8–11) and remove the extended grease fittings from the speed reducer. Replace the Alemite fitting (para 8–11*g*) on the end of the extended grease fitting.

8–16. Disassembly of Speed Reducer
(fig. 8–19)

a. Remove the plug (303), the coupling (302), the pipe (301), and the elbow (300) from the speed reducer housing (353).

b. Remove thermal switch S806 (304) from the housing.

c. Loosen and remove the six ⅝-inch by 11 by 1⅝-inch hexagonal-head capscrews (305) and then remove the upper bearing cap (306) and the shim (307) from the upper bearing carrier (312).

d. Remove the oil seal (308) from the upper bearing cap (306).

e. Loosen and remove the eight ⅝-inch by 11 by 1⅝-inch hexagonal-head capscrews (310), and then

remove the upper bearing carrier (312) and gasket (313) from the housing (353).

f. Remove the upper roller bearing cup (314), the upper roller bearing cone (315), the grease retainer (316), and the upper gear-bearing spacer (317) from the gear shaft.

g. Hold the cone gear (318) in place with one hand and pull the gear shaft (319) from the housing (353) with the other hand.

h. Remove the cone gear (318) and the lower gear-bearing spacer (321).

i. Loosen and remove the six $\frac{5}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrews (322) and then remove the lower bearing cap (323) and the shim (325).

j. Remove the lower roller bearing cup (325) and the lower roller bearing cone (326).

k. Loosen and remove the hexagonal nuts (327) and the lockwashers (328) that fasten speed reducer heater HR810 (329) to the housing. Remove the heater and replace the lockwashers and hexagonal nuts.

l. Loosen and remove the six $\frac{5}{8}$-inch by 11 by $2\frac{1}{4}$-inch hexagonal-head capscrews (330) that attach the worm thrust bearing cap (331) and the worm thrust bearing carrier (335) to the housing (353). Remove the worm thrust bearing cap (331) and the worm thrust bearing cap shim (332).

m. Loosen and remove the outer locknut (333), the lockwasher (334), and the inner locknut (333) from the worm shaft (309).

n. Remove the worm thrust bearing carrier (335) and the shim (336) from the housing (353).

o. Remove the left-hand thrust roller bearing cup (337), the left-hand thrust roller bearing cone (338), the two spacers (339 and 340), the right-hand thrust roller bearing cup (341), and the right-hand thrust roller bearing cone (342) from the worm thrust bearing carrier (335).

p. Loosen and remove the six $\frac{5}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrews (343) that attach the worm radial bearing carrier (344) to the housing (353).

q. Pull the worm shaft (309) from the housing (353). This action also removes the oil seal (346), the worm radial bearing carrier (344), and the radial roller bearing (348) from the housing (353).

r. Loosen the Allen setscrew (347) and remove the oil seal (346) from the worm shaft (309).

s. Remove the worm radial bearing carrier (344) and the shim (345) from the worm shaft (309).

t. Remove the radial roller bearing (348) from the worm shaft (309).

u. Remove the breather cap (349), the bushing (350), the oil level gage (351), and the drain cock (352) from the housing (353).

8–17. Removal of Motor and Speed Reducer Base

(fig. 8–20)

Loosen and remove the six $\frac{5}{8}$-inch by 11 by $1\frac{3}{4}$-inch hexagonal-head capscrews (355), the lockwasher (356), and the flat washer (357) and dismount the motor and speed reducer base (291) from the base frame (358).

8–18. Removal of 24-Speed Synchro Housing Assembly

(fig. 8–21)

a. Loosen and remove the ten $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews (360), the lockwashers (361), and the flat washers (362) that attach dustpan section A865 (363) to the dust cover (364).

b. Loosen and remove the six $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews (365) and the flat washers (366) that fasten the two dustpan sections to the synchro housing assembly (378) and the gear housing (8, fig. 8–23), and then remove dustpan section A865 (363, fig. 8–21).

c. Disconnect and tag the cables running to the 24-speed synchro.

d. Loosen and remove the four $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrews (367), the lockwashers (368), the flat washers (369), and the hexagonal nuts (370) that attach synchro housing assembly MP828 (378) to the synchro mounting plate (371). Remove synchro housing assembly MP828 (378) by pushing it up to free it from the lockpins (372) and then pulling it out from the synchro mounting plate (371).

8–19. Disassembly of Synchro Housing Assembly MP828

(fig. 8–22)

a. Use a suitable tool and remove the retainer ring (405). Remove gears C and D shaft assembly MP829 (406) from housing A817 (407).

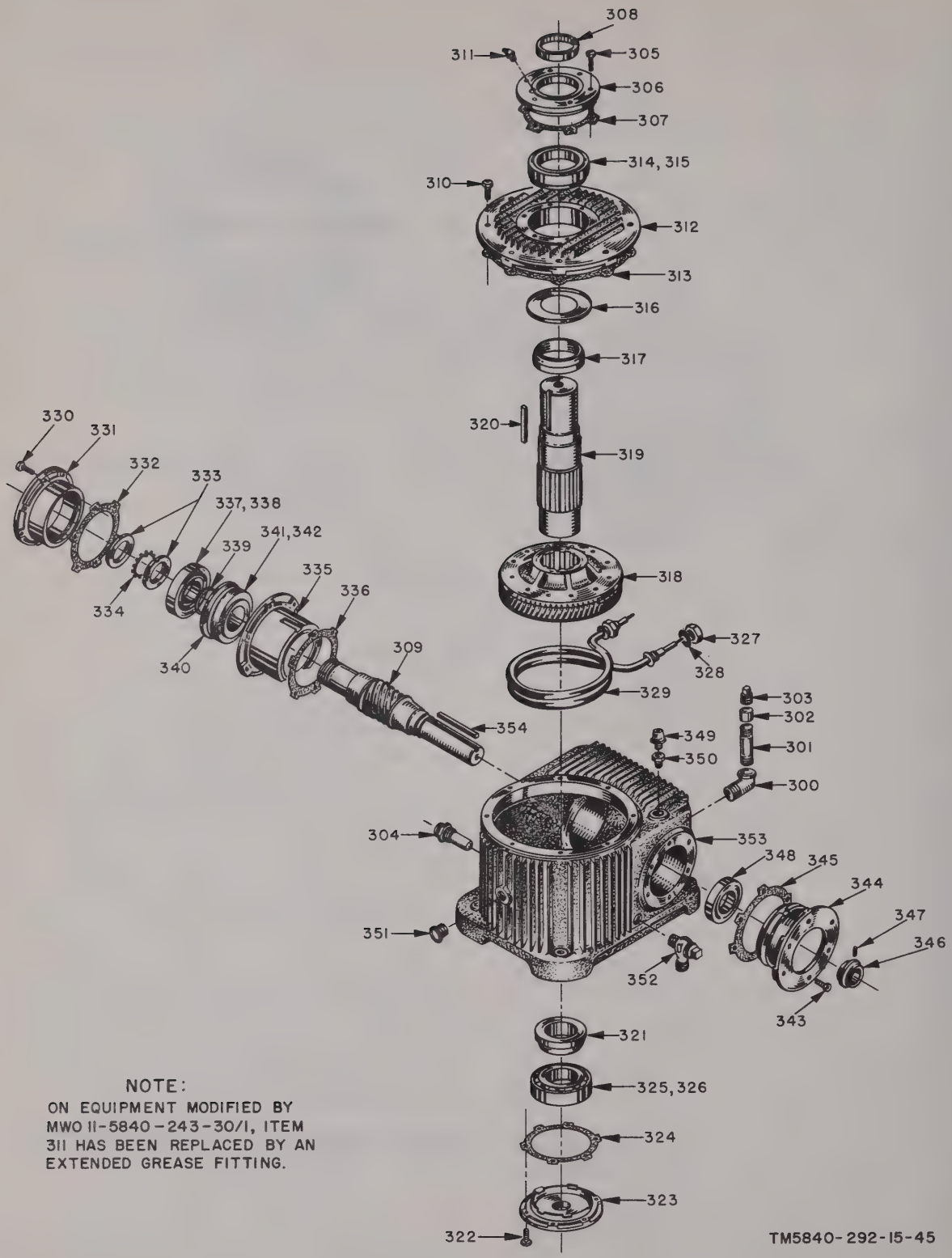


Figure 8-19. Speed reducer MP864, exploded view.

300 Elbow (MP1877)
301 Pipe (MP11807)
302 Coupling (MP1878)
303 Plug (MP1874)
304 Thermal switch (S806)
305 $\frac{3}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrew
306 Upper bearing cap (A1801)
307 Shim (MP11832)
308 Oil seal (MP11809)
309 Worm shaft (MP11802)
310 $\frac{3}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrew
311 Grease fitting (MP11804)
312 Upper bearing carrier (A1807)
313 Gasket (MP11829)
314 Upper roller bearing cup (MP11815)
315 Upper roller bearing cone (MP11816)
316 Grease retainer (MP11801)
317 Upper gear-bearing spacer (MP11833)
318 Cone gear (MP11803)
319 Gear shaft (MP11830)
320 Key (MP11817)
321 Lower gear-bearing spacer (MP11833–1)
322 $\frac{3}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrew
323 Lower bearing cap (A1805)
324 Shim (MP11832)
325 Lower roller bearing cup (MP11815–1)
326 Lower roller bearing cone (MP11816–1)
327 Hexagonal nut
328 Lockwasher
329 Speed reducer heater (HR810)
330 $\frac{3}{8}$-inch by 11 by $2\frac{1}{4}$-inch hexagonal-head capscrew
331 Worm thrust bearing cap (A1803)
332 Worm thrust bearing cap shim (MP11800)
333 Locknuts
334 Lockwashers
335 Worm thrust bearing carrier (A1802)
336 Shim (MP11831)
337 Left-hand thrust roller bearing cup (part of MP11812)
338 Left-hand thrust roller bearing cone (part of MP11812)
339 Spacer
340 Spacer
341 Right-hand thrust roller bearing cup (part of MP-11812–1)
342 Right-hand thrust roller bearing cone (part of MP-11812–1)
343 $\frac{3}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrew
344 Worm radial bearing carrier (A1804)
345 Shim (MP11831)
346 Oil seal (MP11808)
347 Allen setscrew
348 Radial roller bearing (MP813)
349 Breather cap (MP11811)
350 Bushing
351 Oil level gage (MP11810)
352 Drain cock (MP1871)
353 Housing (A899)
354 Key (MP11818)

Figure 8–19.—Continued

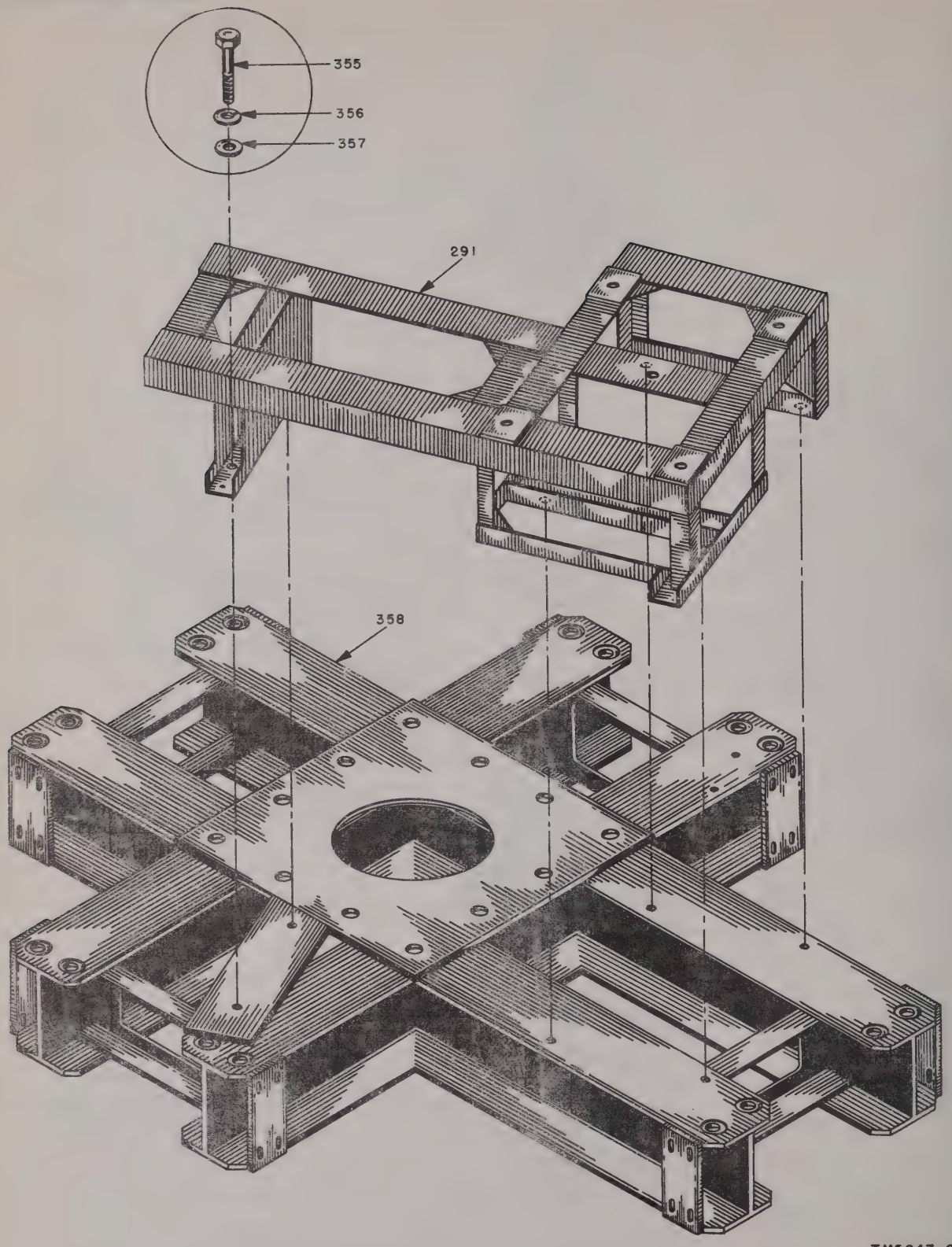
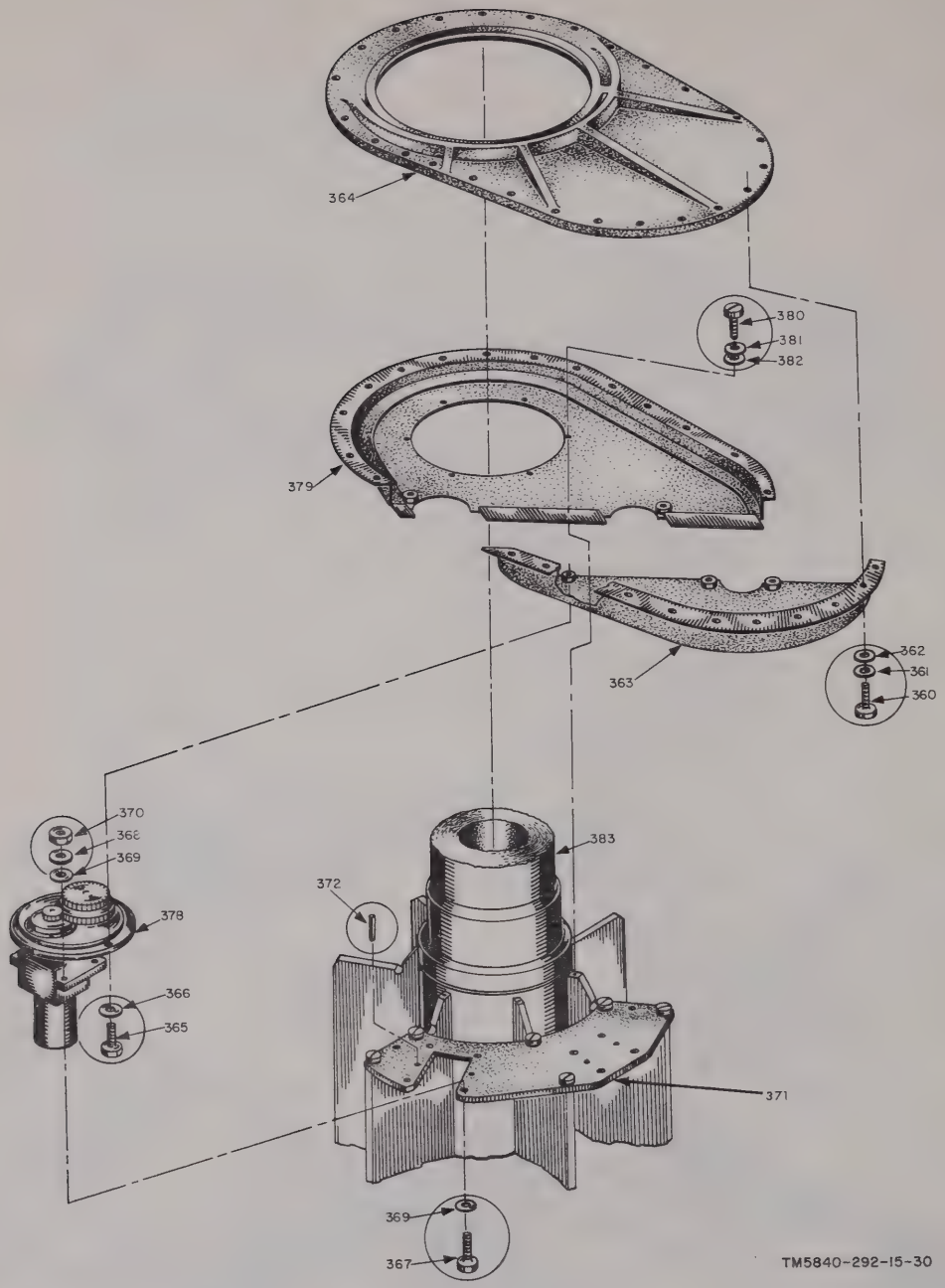


Figure 8-20. Motor and speed reducer base, dismounting.

291 Motor and speed reducer base (A826)
355 $\frac{5}{8}$-inch by 11 by $1\frac{3}{4}$-inch hexagonal-head capscrew
356 $\frac{5}{8}$-inch lockwasher
357 $\frac{5}{8}$-inch flat washer
358 Base frame (A813)

Figure 8–20.—Continued



360 $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrew
361 $\frac{1}{4}$-inch lockwasher
362 $\frac{1}{4}$-inch flat washer
363 Dustpan section (A865)
364 Dust cover (A863)
365 $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrew
366 $\frac{5}{16}$-inch flat washer
367 $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrew
368 $\frac{5}{16}$-inch lockwasher
369 $\frac{5}{16}$-inch flat washer
370 $\frac{5}{16}$-inch by 18 hexagonal nut
371 Synchro mounting plate (A816)
372 Lockpins (H866)
378 Synchro housing assembly (MP828)
379 Dustpan section (A862)
380 $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrew
381 $\frac{1}{4}$-inch lockwasher
382 $\frac{1}{4}$-inch flat washer
383 King post (A814)

Figure 8-21. Dismounting 24-speed synchro housing assembly.

b. Remove the upper ball bearing (408) and the spacer (409) from the housing.

c. Remove the retainer ring (410) and the lower ball bearing (411) from the housing.

d. Loosen and remove the four 6 by 32 by $\frac{3}{8}$-inch binder-head machine screws (412), the lockwashers (413), and the flat washers (414), and then remove the cover (415) from the housing.

e. Loosen and disengage the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head captive screws (416); remove the two synchro clamps (417) from the housing, and the 24-speed synchro (418) with coupling flange MP837 (419) from the housing.

f. Remove the nut and washer, and dismount the coupling flange (419) from the synchro shaft.

g. Remove the retainer ring (420) and the coupling ring (421) from coupling flange MP834 (423).

h. Remove the retainer ring (422) and coupling flange MP834 (423) from the gear E shaft assembly (424).

i. Press the gear E shaft assembly (424), the spacer (425), the upper ball bearing (426), and the spacer (427) from the housing.

j. Extract the retainer rings (428 and 430) and the lower ball bearing (429) from the housing.

8–20. Removal of Single-Speed Gear Housing Assembly

(fig. 8–23)

a. Removal of Resolver B825 and Single-Speed Synchro B802 from Gear Housing. To remove resolver B825 (11) and single-speed synchro B802 (10) from the gear housing (8), proceed as follows:

(1) Tag and identify the leads attached to single-speed synchro B802 (10) and resolver B825 (11).

(2) Remove the leads attached to single-speed synchro B802 and resolver B825.

(3) Remove the gear housing cover (15) by loosening and removing the eight 8 by 32 by $\frac{1}{2}$-inch long slotted screws (16), the lockwashers (17), and the flat washers (18).

(4) Loosen the Allen capscrews on the lower resolver hub clamp (19) that secures the resolver flexible coupling (20) to the resolver shaft.

(5) Loosen the wingnut (21) on the vernier clamp (22) until the vernier clamp is free of resolver B825 (11).

(6) While supporting resolver B825 (11), loosen and disengage the four captive screws (23) with the lockwashers (24) attached that secure the vernier base (25) and the resolver clamp (26) to the bottom of the gear housing (8). Lower resolver B825 (11) from the gear housing (8).

(7) Loosen the Allen capscrew on the lower synchro hub clamp (30) that secures the synchro flexible coupling (31) to the shaft on single-speed synchro B802 (10).

(8) While supporting single-speed synchro B802 (10), loosen and disengage the four captive screws (32) with the lockwashers (33) attached that secure the synchro clamps (34) to the bottom of the gear housing (8). Lower single-speed synchro B802 from the gear housing (8).

b. Removal of Dustpan Section A865. If dustpan section A865 is already removed, proceed with *c* below. To remove dustpan section A865 (1) from dustpan section A862 (2), proceed as follows:

(1) Loosen and remove the ten $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch long hexagonal-head capscrews (3), the lockwashers (4), and the flat washers (5).

(2) Loosen and remove the four $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch long hexagonal-head capscrews (6) and the flat washers (7) that secure the related portions of dustpan section A865 (1) to the flanges of the gear housing (8) and the housing for 24-speed synchro B803.

(3) Remove dustpan section A865 (1).

c. Removal of Single-Speed Gear Housing Assembly from Synchro Mounting Plate A816. To remove the single-speed gear housing assembly (8) from synchro mounting plate A816 (9), proceed as follows:

(1) Loosen and remove the $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrew (6) and the flat washer (7) that secure dustpan section A862 (2) to the flange on the gear housing (8).

(2) While supporting the single-speed gearing housing assembly, loosen and remove the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch long hexagonal-head capscrews (12) and the lock-

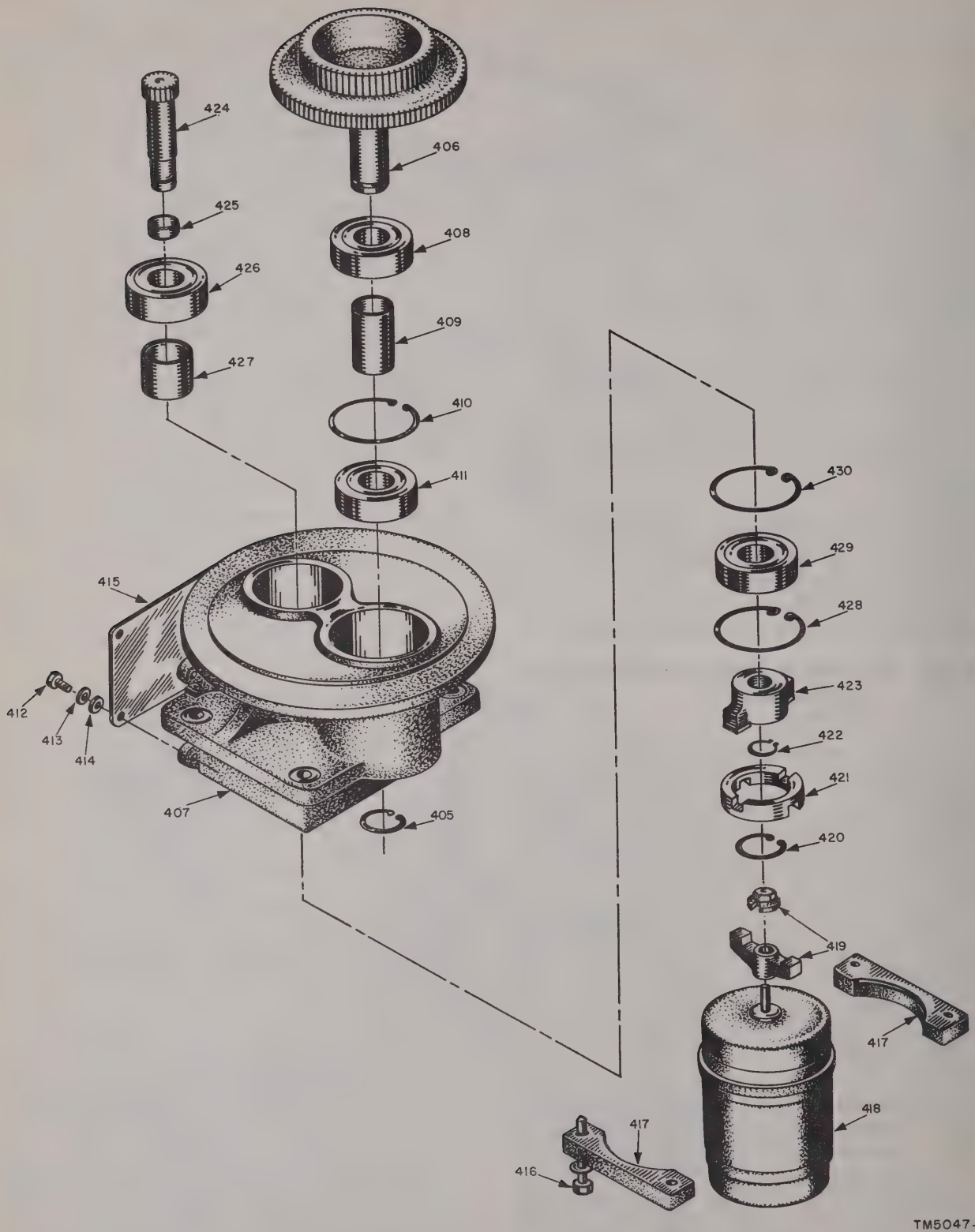


Figure 8-22. 24-speed synchro housing assembly MP828, exploded view.

405 Retainer ring (MP830)
406 Gears C and D shaft assembly (MP829)
407 Housing (A817)
408 Upper ball bearing (MP835)
409 Spacer (H822)
410 Retainer ring (H816)
411 Lower ball bearing (MP835)
412 6 by 32 by $\frac{3}{8}$-inch binder-head machine screw
413 No. 6 lockwasher
414 No. 6 flat washer
415 Cover (A818)
416 $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head captive screw
417 Synchro clamps (MP831 and MP832)
418 Synchro, 24-speed (B803)
419 Coupling flange (MP837), washer, and nut
420 Retainer ring (H830)
421 Coupling ring (MP843)
422 Retainer ring (H829)
423 Coupling flange (MP834)
424 Gear E shaft assembly (MP836)
425 Spacer (H824)
426 Upper ball bearing (MP840)
427 Spacer (H820)
428 Retainer ring (H818)
429 Lower ball bearing (MP841)
430 Retainer ring (H817)

Figure 8–22.—Continued

washers (13) that secure the gear housing (8) to synchro mounting plate A816 (9).

(3) Remove the single-speed gear housing assembly from synchro mounting plate A816 (9) by pushing downward to free it from two lockpins H866 (14).

8–21. Disassembly of Single-Speed Gear Housing Assembly
(fig. 8–23)

a. Disassembly of Parts Attaching to Vernier Base. To disassemble parts attaching to the vernier base (25), perform the following:

(1) Remove the external retaining ring (27) from the end of the vernier screw (28).

(2) Remove the vernier screw (28) to free the vernier clamp (22) and the vernier nut (29).

b. Removal of Spur Gear A, Gear Shaft A, and Associated Parts. To remove spur gear A (35), gear shaft A (36), and the associated parts, proceed as follows:

(1) Loosen the Allen capscrew on the upper resolver hub clamp (37). Remove the resolver flexible coupling (20) and the upper resolver hub clamp (37).

(2) Remove the internal retaining ring (38) and spur gear B (39) from the splined portion of gear shaft A (36).

(3) Remove spur gear A (35) with attaching gear shaft A (36) from the top of the gear housing (8). Remove the upper resolver ball bearing (40) and spacer A (41) through the top of the gear housing.

(4) Remove the spring pin (42) and disengage spur gear A (35) from gear shaft A (36).

(5) Remove the internal retaining ring (43), the lower resolver ball bearing (44), and the other internal retaining ring (45).

c. Removal of Gear Shaft B and Associated Parts. To remove gear shaft B (46) and associated parts, proceed as follows:

(1) Loosen the Allen capscrew on the upper synchro hub clamp (47). Remove the synchro flexible coupling (31) and the upper synchro hub clamp (47).

(2) Remove the internal retaining ring (48), and then remove spur gear C (49) from the splined portion of gear shaft B (46).

(3) Loosen and remove the three 6 by 32 by $\frac{7}{16}$-inch long flathead screws (50), and then remove the ball bearing cover (51).

(4) Remove gear shaft B (46) with attaching internal retaining ring (52). Remove the upper synchro ball bearing (53) and spacer B (54).

(5) Remove the internal retaining ring (52) from gear shaft B (46).

(6) Remove the internal retaining ring (55), the lower synchro ball bearing (56), and the other internal retaining ring (57).

8–22. Removal of Lubrication Oil Sump
(fig. 8–24)

a. Drain the lubricant from the lubricating oil sump (para 5–9*b*(3)).

b. At terminal board TB807 on the sump cover, disconnect the cable that connects TB807 to TB805 and TB806.

c. Remove the four $\frac{3}{8}$-inch by 16 by $1\frac{1}{4}$-inch binder-head machine screws (431), the lockwashers (432), and the flat washers (433). Carefully lift the lubricating oil sump (434) from the base frame (358).

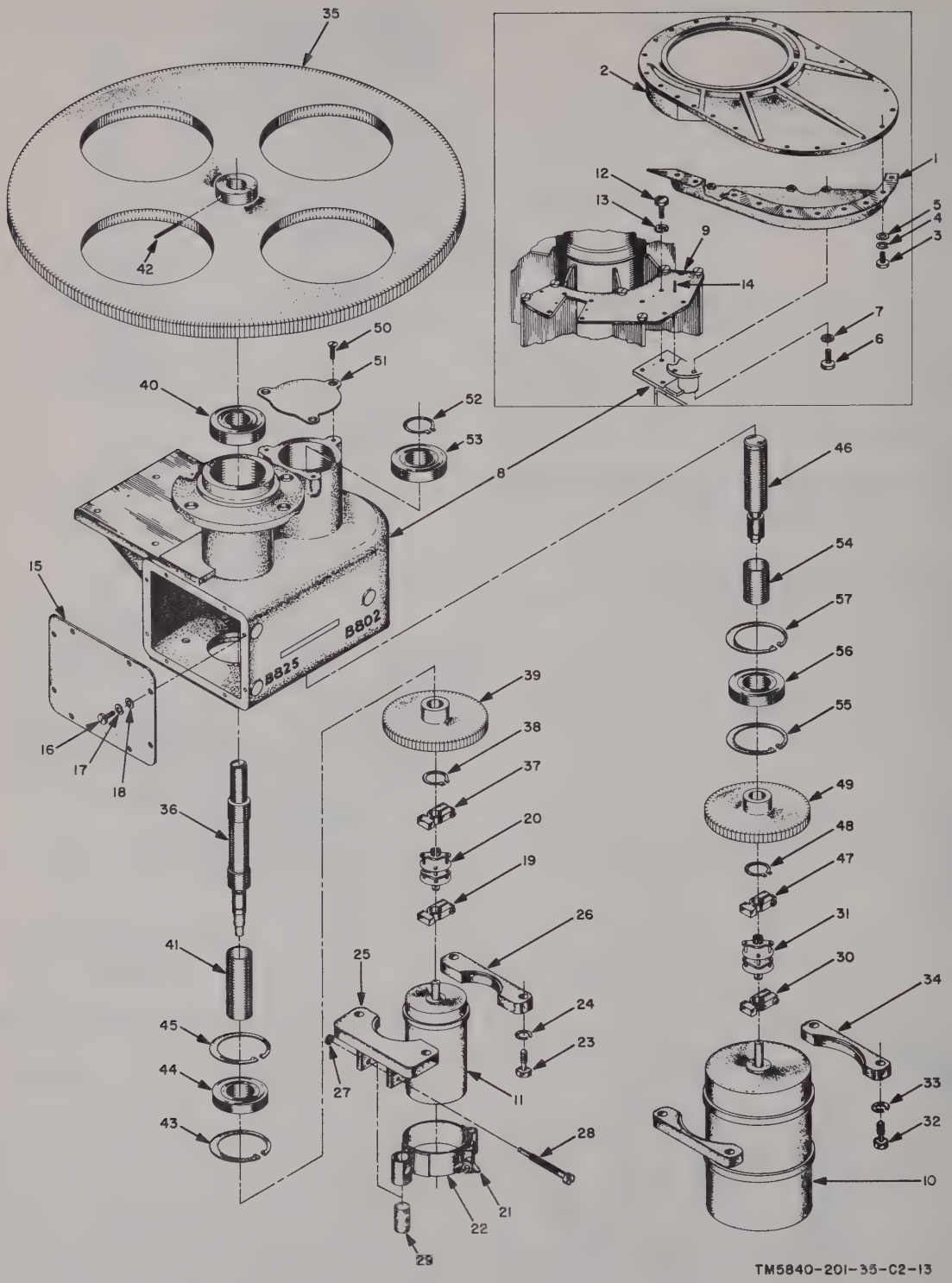
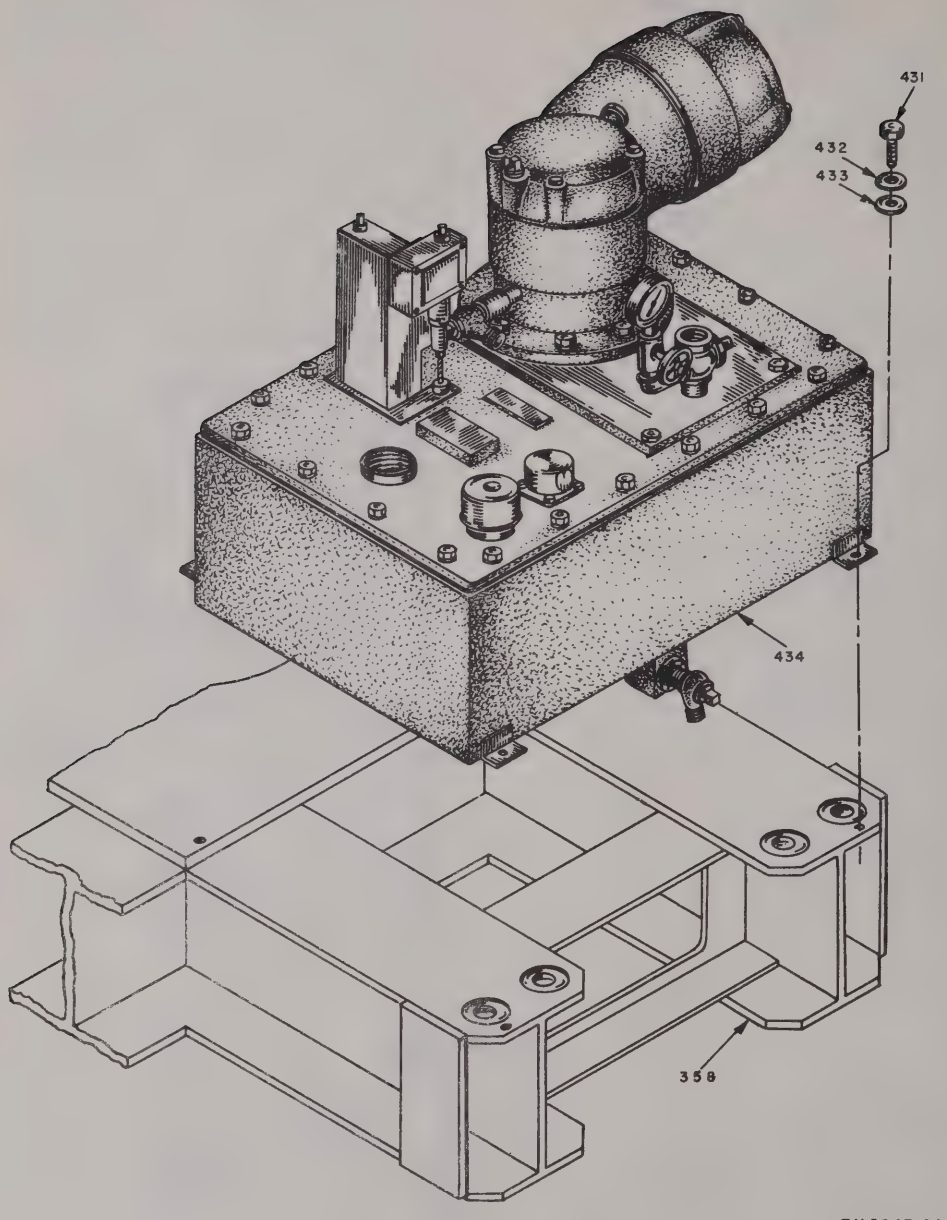


Figure 8–23. Single-speed gear housing assembly, exploded view.

1 Dustpan section (A865)
2 Dustpan section (A862)
3 $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrew (10)
4 $\frac{1}{4}$-inch lockwasher (10)
5 $\frac{1}{4}$-inch flat washer (10)
6 $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrew (5)
7 $\frac{5}{16}$-inch flat washer (5)
8 Gear housing
9 Synchro mounting plate (A816)
10 Single-speed synchro (B802)
11 Resolver (B825)
12 $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrew (4)
13 $\frac{1}{4}$-inch lockwasher (4)
14 Lockpin (H866) (2)
15 Gear housing cover
16 6 by 32 by $\frac{1}{2}$-inch slotted screw (8)
17 No. 6 lockwasher (8)
18 No. 6 flat washer (8)
19 Resolver hub clamp (lower)
20 Resolver flexible coupling
21 10 by 32 wingnut
22 Vernier clamp
23 Captive screw (4)
24 $\frac{1}{4}$-inch lockwasher (4)
25 Vernier base
26 Resolver clamp
27 Retaining ring (external)
28 Vernier screw
29 Vernier nut
30 Synchro hub clamp (lower)
31 Synchro flexible coupling
32 Captive screw (4)
33 $\frac{1}{4}$-inch lockwasher (4)
34 Synchro clamp (2)
35 Spur gear A
36 Gear shaft A
37 Resolver hub clamp (upper)
38 Retaining ring (internal)
39 Spur gear B
40 Resolver ball bearing (upper)
41 Spacer A
42 Spur pin
43 Retaining ring (internal)
44 Resolver ball bearing (lower)
45 Retaining ring (internal)
46 Gear shaft B
47 Synchro hub clamp (upper)
48 Retaining ring (internal)
49 Spur gear C
50 6 by 32 by $\frac{7}{16}$-inch flathead screw (3)
51 Ball bearing cover
52 Retaining ring (internal)
53 Synchro ball bearing (upper)
54 Spacer B
55 Retaining ring (internal)
56 Synchro ball bearing (lower)
57 Retaining ring (internal)

Figure 8-23.—Continued



358 Base frame (A813)
431 $\frac{3}{8}$-inch by 16 by $1\frac{1}{4}$-inch hexagonal-head capscrew
432 $\frac{3}{8}$-inch lockwasher
433 $\frac{3}{8}$-inch flat washer
434 Lubricating oil sump (U801)

Figure 8–24. Lubricating oil sump, dismounting.

8–23. Removal of Rotor Assembly
(fig. 8–25)

a. To facilitate reassembly, place an identification mark on the top edge of the rotor (454), the oil seal retainer ring (448), and the bearing retainer ring (452).

Note. If the procedure given in paragraph 8–7*g* has been performed, omit *b* and *c* below, and proceed with *d* below.

b. Loosen and remove the two 10 by 24 by 1½-inch binder-head machine screws (436) and the lockwashers (437), and then remove the brush assembly (438), the spacer (439), and the shim (440).

c. Loosen and remove the four 10 by 24 by ¾-inch binder-head machine screws (441) and the lockwashers (442), and then remove the collector ring and cable (443) from the rotor.

d. Remove the O-ring gasket (444) from the top of the rotor.

e. Loosen and remove the six $\frac{5}{16}$-inch by 18 by 1¾-inch hexagonal socket-head capscrews (445), the lockwashers (446), and the flat washers (447), and then remove the oil seal retainer ring (448) from the rotor.

f. Remove the oil seal (449) from the oil seal retainer ring (448).

g. Loosen and remove the six ½-inch by 13 by 1½-inch hexagonal socket-head capscrews (450) and the lockwashers (451), and then remove the bearing retainer ring (452) and the shim (453) from the rotor (454).

h. Loosen and remove the fifteen ¼-inch by 20 by ⅞-inch hexagonal-head capscrews (455, fig. 8–26), the lockwashers (456), and the flat washers (457) that attach dustpan section A862 (379) to the dust cover (364).

i. Attach a cable to each of the two screw eyes (475) and lift the rotor straight up and off the king post. This removes all of the rotor assembly from the king post except the lower roller bearing cone and rollers (495, fig. 8–27) and the sealing ring (494) (para 8–25).

8–24. Disassembly of Rotor Assembly
(fig. 8–26)

a. Loosen and remove the six ¼-inch by 20 by ⅞-inch hexagonal-head capscrews (380, fig. 8–21), the lockwashers (381), and the flat washers (382), and then remove dustpan section A862 (379) from the king post (383).

b. Remove the upper roller bearing cone and rollers (458, fig. 8–26) from the top of the rotor.

c. To replace the upper roller bearing cup (459), extract it from the rotor.

d. Remove the oil seal (460) from the top of the rotor.

e. Pull the dust cover (364) from the synchro drive gear (461).

f. Remove the oil seal (462) from the dust cover (364).

g. Loosen and remove the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal socket-head capscrews (463) and the lockwashers (464) that attach the synchro drive gear (461) to the main drive gear (468). Turn two of these screws into the two threaded holes in the synchro drive gear (461), and jack it from the main drive gear (468).

h. Remove the oil seal (465) from the rotor (454).

i. Loosen and remove the six ⅝-inch by 11 by 5-inch hexagonal socket-head capscrews (466) and the lockwashers (467), and then remove the main drive gear (468) and the key (469) from the rotor (454).

j. Remove the oil seal (470) from the rotor. The lower roller bearing cup (471) may be removed for replacement.

k. Remove the bellows (para 8–9*b*) from the rotor (454).

l. Loosen and remove the two ¼-inch by 20 by ¾-inch binder-head machine screws (472) and the lockwashers (473), and then remove the cam (474) from the main drive gear (468).

8–25. Removal of King Post
(fig. 8–27)

a. Loosen and remove the two ¼-inch by 20 by 1-inch hexagonal-head capscrews (482), the lockwashers (483), and the flat washers (484), and dismount the terminal board bracket (485) from the king post (383).

b. Loosen and remove the two 10 by 24 by ¾-inch fillister-head screws (568), the lockwashers (569), and the flat washers (570), and dismount the relay box bracket (567) from the king post (383).

c. Loosen and remove the six ¼-inch by 20 by 1-inch hexagonal-head capscrews (486), the lockwashers (487), and the flat washers (488), and lift the synchro mounting plate (371) from the king post (383).

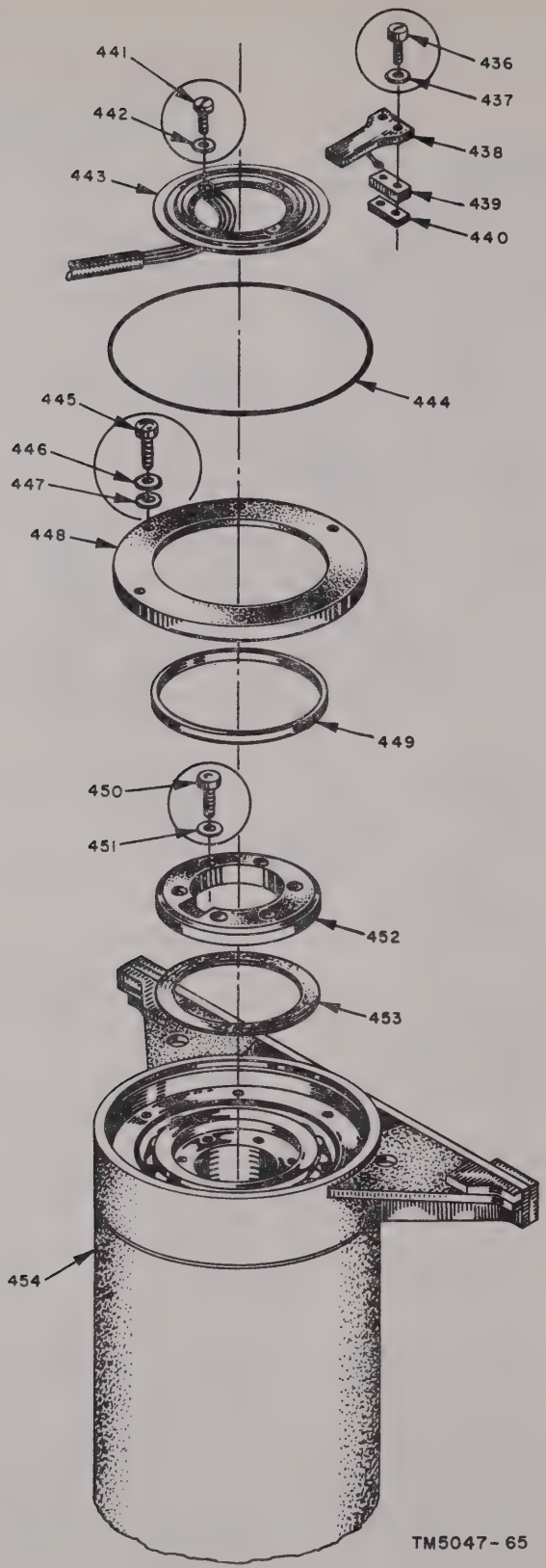


Figure 8-25. Top of rotor assembly, exploded view.

436 10 by 24 by 1½-inch binder-head machine screw
437 No. 10 lockwasher
438 Brush assembly (E813)
439 Spacer (MP1805)
440 Shim (MP1806)
441 10 by 24 by ¾-inch binder-head machine screw
442 No. 10 lockwasher
443 Collector ring (E812) and cable
444 O-ring gasket (H858)
445 $\frac{5}{16}$-inch by 18 by 1¾-inch hexagonal socket-head capscrew
446 $\frac{5}{16}$-inch lockwasher
447 $\frac{5}{16}$-inch flat washer
448 Oil seal retainer ring (E864)
449 Oil seal (MP1807)
450 ½-inch by 13 by 1½-inch hexagonal socket-head capscrew
451 ½-inch lockwasher
452 Bearing retainer ring (E863)
453 Shim (MP859)
454 Rotor (A812)

Figure 8–25.—Continued

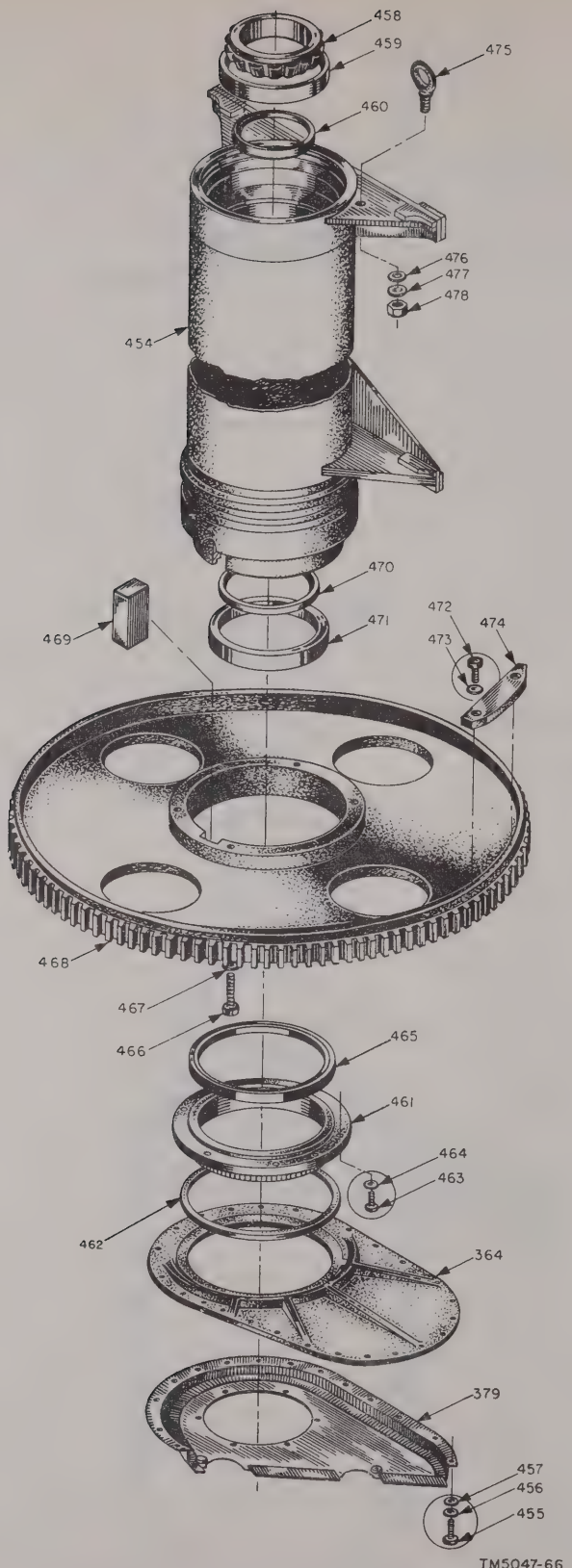


Figure 8–26. Rotor assembly, exploded view.

364 Dust cover (A863)
379 Dustpan section (A862)
454 Rotor (A812)
455 ¼-inch by 20 by ⅞-inch hexagonal-head capscrew
456 ¼-inch lockwasher
457 ¼-inch flat washer
458 Upper roller bearing cone and rollers (part of MP861)
459 Roller bearing cup (part of MP861)
460 Oil seal (MP855)
461 Synchro drive gear (MP847)
462 Oil seal (MP889)
463 $\frac{5}{16}$-inch by 18 by 1-inch hexagonal socket-head capscrew
464 $\frac{5}{8}$-inch lockwasher
465 Oil seal (MP849)
466 $\frac{5}{8}$-inch by 11 by 5-inch hexagonal socket-head capscrew
467 $\frac{5}{8}$-inch lockwasher
468 Main drive gear (MP848)
469 Key (H832)
470 Oil seal (MP1808)
471 Lower roller bearing cup (part of MP852)
472 ¼-inch by 20 by ¾-inch binder-head machine screw
473 ¼-inch lockwasher
474 Cam (MP890)
475 1 by 8 by 2½-inch screw eye
476 1-inch flat washer
477 1-inch lockwasher
478 1 by 8 hexagonal nut

Figure 8–26.—Continued

d. To facilitate reassembly, make a reference mark on the king post (383) and the base frame (358). Loosen and remove the twelve 1 by 8 by 3½-inch hexagonal-head capscrews (490), the 24 flat washers (491), the 12 lockwashers (492), and the hexagonal nuts (493), and then remove the king post (383) from the base frame (358).

Note. Do not remove the dowel pins (496) because they are used to position the king post during installation.

8–26. Disassembly of Lubricating Oil Sump
(fig. 8–28)

a. Disconnect and tag the electrical cable and its conductors from the lubrication pump motor. Disconnect the cable connections from heaters HR811 and HR812.

b. Dismount and disassemble the pump and motor assembly as follows:

(1) Loosen and remove the four $\frac{5}{16}$-inch capscrews (511) and the lockwashers (512), and carefully lift the pump and motor assembly out of the sump. Dismount the gasket (513).
(2) Loosen the ferrules on the upper tube connector (550) and the lower tube connector (549), and dismount the tube assembly (551).
(3) Loosen the setscrew (545) in the lower half of the flexible coupling (543).
(4) Loosen and remove the two $\frac{5}{16}$-inch capscrews (519), the lockwashers (518), and the flat washers (517), and dismount the pump bracket (515) and the pump support block (516) from the rest of the pump and motor assembly.
(5) Loosen and remove the two 10 by 24 machine screws (521), and dismount the pump support block (516) from the pump bracket (515).
(6) Loosen and remove the two ¼-inch capscrews (548), the lockwashers (547), and the nuts (514), and dismount the pump (546) from the pump bracket (515).
(7) Loosen the setscrew (544) in the upper half of the flexible coupling, and dismount the flexible coupling (543) and the key (542) from the shaft of the gear head of lubrication pump motor B804 (505).
(8) Loosen and remove the eight ⅜-inch capscrews (506) and the lockwashers (507), and dismount lubrication pump motor B804 (505) and the spacer (508) from the pump assembly mounting plate (510).
(9) The lower tube connector (549) and the 1-inch by ¾-inch reducing bushing (557) can be removed from the pump. The upper tube connector (550) can be removed from the pump assembly mounting plate (510).
(10) The pressure gage and oil discharge assembly comprising a ¾-inch close nipple (558), a ¾-inch cross fitting (559), a ¾-inch by ¼-inch street elbow (561), a ¼-inch close nipple (562), a gage shutoff (563), a gage (564), a ¾-inch pipe plug (565), and a ¾-inch to ½-inch reducing bushing (566) can be dismounted from the pump assembly mounting plate (510) if necessary.

c. Dismount the parts from the sump cover (528) as follows:

(1) Loosen and remove the four 10 by 24 recessed head capscrews (523) and the lockwashers (525), and withdraw the level gage (526) and the gasket (527) from the sump cover (528).

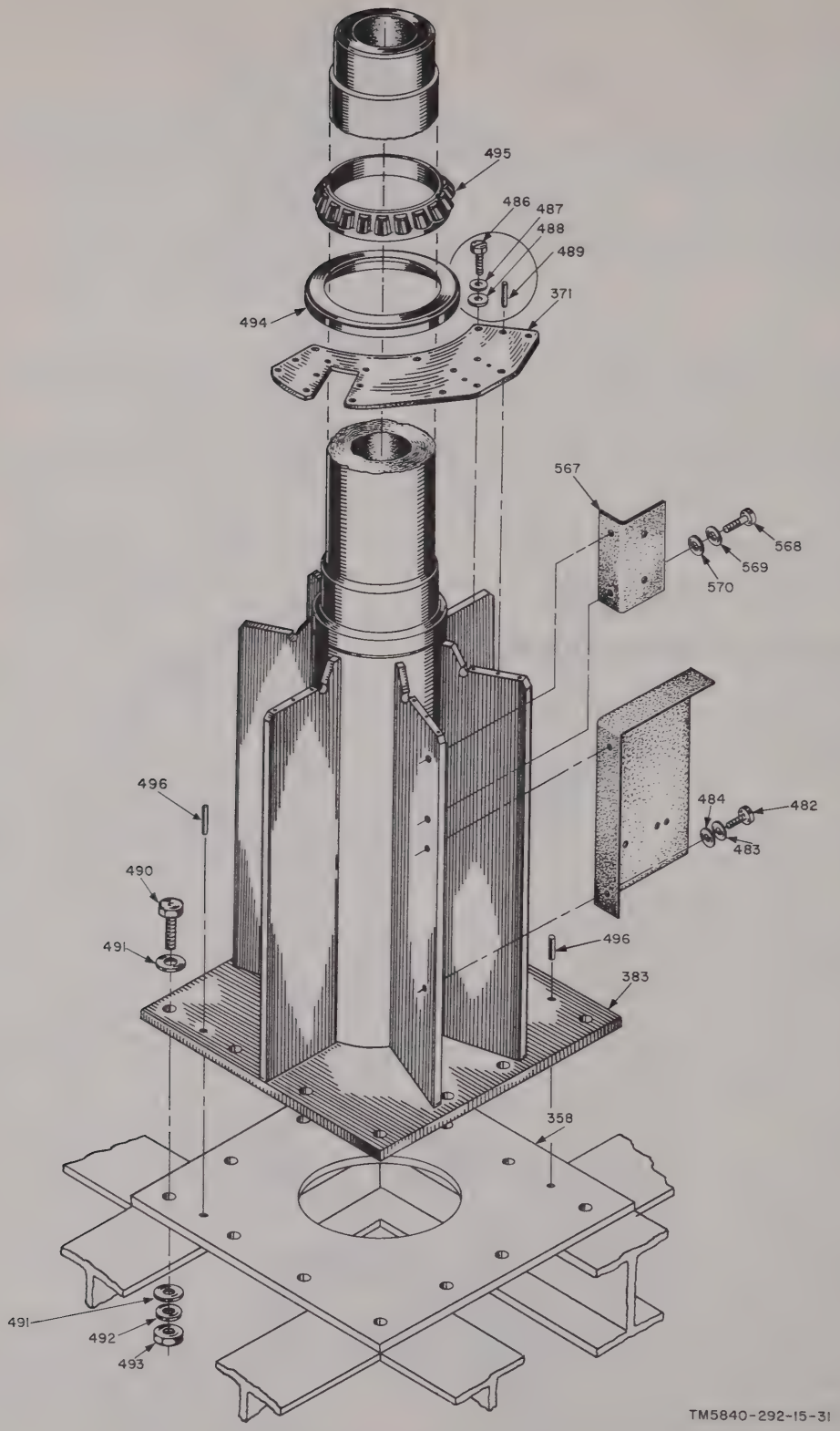


Figure 8-27. King post mounting, exploded view.

358 Base frame (A813)
371 Synchro mounting plate (A816)
383 King post (A814)
482 ¼-inch by 20 by 1-inch hexagonal-head capscrew
483 ¼-inch lockwasher
484 ¼-inch flat washer
485 Terminal board bracket (A855)
486 ¼-inch by 20 by 1-inch hexagonal-head capscrew
487 ¼-inch lockwasher
488 ¼-inch flat washer
489 Lockpin (H866)
490 1-inch by 8 by 3½-inch hexagonal-head capscrew
491 1-inch flat washer
492 1-inch lockwasher
493 1-inch by 8 hexagonal nut
494 Sealing ring (MP850)
495 Lower roller bearing cone and roller (part of MP852)
496 Dowel pin, ⅜-inch
567 Relay box bracket
568 10 by 24 by ¾-inch fillister-head screw
569 No. 10 lockwasher
570 No. 10 flat washer

Figure 8–27.—Continued

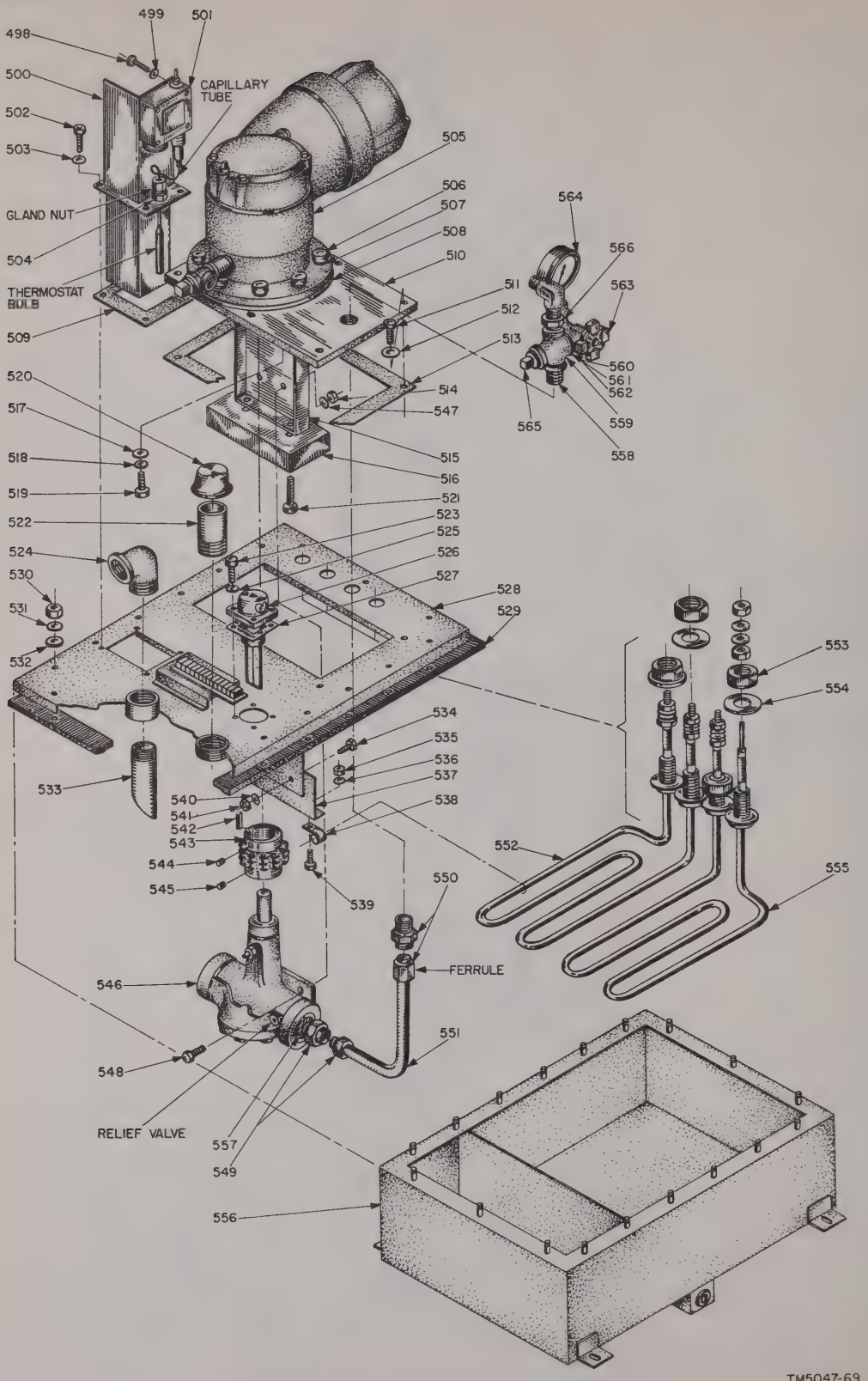


Figure 8-28. Lubricating oil sump, exploded view.

498 10 by 32 machine screw
499 Lockwasher
500 Thermostat mounting bracket (MP11839)
501 Heater thermostat switch (S808)
502 10 by 24 machine screw
503 Lockwasher
504 Capillary tube fitting (part of S808)
505 Lubrication pump motor (B804)
506 $\frac{3}{8}$-inch capscrew
507 Lockwasher
508 Spacer (MP11836)
509 Gasket (MP11838)
510 Pump assembly mounting plate (A1808)
511 $\frac{5}{16}$-inch capscrew
512 Lockwasher
513 Gasket (MP11837)
514 Nut
515 Pump bracket (A1810)
516 Pump support block
517 Flat washer
518 Lockwasher
519 $\frac{5}{16}$-inch capscrew
520 Fillercap (MP11864)
521 10 by 24 machine screw
522 Filler pipe (MP11865)
523 10 by 24 recessed head capscrew
524 Drain line elbow (MP1832)
525 Lockwasher
526 Level gage (MP11867)
527 Gasket (MP11868)
528 Sump cover (A1811)
529 Sump gasket (MP11866)
530 $\frac{3}{8}$-inch nut
531 Lockwasher
532 Flat washer
533 Oil drain pipe (MP11870)
534 8 by 32 machine screw
535 Nut
536 Lockwasher
537 Heater clamp bracket (A1813)
538 Heater clamp (MP11871)
539 8 by 32 machine screw
540 Lockwasher
541 Nut
542 Key (part of B804)
543 Flexible coupling (MP11835)
544 Setscrew
545 Setscrew
546 Pump (U801-1)
547 Lockwasher
548 $\frac{1}{4}$-inch capscrew
549 Lower tube connector (part of MP11869)
550 Upper tube connector (part of MP11869)
551 Tube assembly (MP11869)
552 Sump heater (HR811)
553 Heater mounting nut (part of HR811)
554 Flat washer
555 Sump heater (HR812)
556 Sump (A1812)
557 1-inch by $\frac{3}{4}$-inch reducing bushing
558 $\frac{3}{4}$-inch close nipple
559 $\frac{3}{4}$-inch cross fitting
560 $\frac{3}{4}$-inch by $\frac{1}{4}$-inch reducing bushing
561 $\frac{1}{4}$-inch street elbow
562 $\frac{1}{4}$-inch close nipple
563 Gage shutoff (MP11872)
564 Gage (M851)
565 $\frac{3}{4}$-inch pipe plug
566 $\frac{3}{4}$-inch by $\frac{1}{2}$-inch reducing bushing

Figure 8-28.—Continued

(2) Lift off the fillercap (520) and unscrew the filler pipe (522) from the sump cover (528).

(3) Loosen and remove the four 10 by 24 machine screws (502) and the lockwashers (503), and dismount the thermostat mounting bracket (500) with heater thermostat switch S808 (501) attached, and the gasket (509) from the sump cover (528).

(*a*) Loosen the gland nut on the capillary tube fitting (504), and carefully turn the capillary tube fitting out of the thermostat mounting bracket (500).

(*b*) Loosen and remove the four 10 by 32 machine screws (498), the lockwashers (499), and the nuts (inside the switch enclosure), and dismount heater thermostat switch S808 (501) from the thermostat mounting bracket (500). Draw the capillary tube and thermostat bulb carefully through the hole in the thermostat mounting bracket (500).

d. Dismount the sump cover (528), and remove the sump heaters (552 and 555) as follows:

(1) Loosen and remove the eighteen $\frac{3}{8}$-inch nuts (530), the lockwashers (531), and the flat washers (532), and carefully lift the sump cover (528) and the sump gasket (529) from the sump (556).

(2) Dismount the four heater clamps (538) from the heater clamp bracket (537). The clamps are fastened with 8 by 32 machine screws (539), lockwashers (536), and nuts (535).

(3) Loosen and remove the four heater mounting nuts (553), and the flat washers (554), and carefully dismount sump heaters HR 811 and HR812 (552 and 555) from the sump cover (528).

(4) If necessary, the heater clamp bracket (537) can be dismounted from the baffle that is welded to the bottom of the sump cover by removing the three 8 by 32 machine screws (534), the lockwashers (540), and the nuts (541).

e. If necessary, turn out the drain line elbow (524) and the oil drain pipe (533).

Section II. REASSEMBLY OF ANTENNA PEDESTAL

Note. This section gives directions for reassembly of the antenna pedestal. Some of the units covered in this section are assembled on a bench and then are attached to the pedestal. The assembly instructions for these units precede the installation instructions. Follow the procedure carefully and in the order given. Refer to the illustrations accompanying the disassembly procedure.

8–27. Reassembly of Lubricating Oil Sump
(fig. 8–28)

Note. When assembling threaded pipe fittings, apply teflon tape pipe thread sealer.

a. Turn in the drain line elbow (524) and the oil drain pipe (533).

b. Attach the sump heaters and mount the sump cover as follows:

(1) Carefully mount sump heaters HR811 (552) and HR812 (555) on the sump cover (528), and secure them with the heater mounting nuts (553) and the flat washers (554).
(2) Attach the heater clamp bracket (537) to the baffle welded to the sump cover with the three 8 by 32 machine screws (534), the lockwashers (540), and the nuts (541).
(3) Attach the four heater clamps (538) to the heater clamp bracket (537) and secure the heaters. Use the 8 by 32 machine screws (539), the lockwashers (536), and the nuts (535).
(4) Mount the sump gasket (529) and the sump cover (528) on the sump (556), and fasten it with the eighteen $\frac{3}{8}$-inch nuts (530), the lockwashers (531), and the flat washers (532).

c. Mount the parts on the sump cover as follows:

(1) Mount the level gage (526) and the gasket (527) in the sump cover (528), and attach them with the four 10 by 24 recessed head capscrews (523) and the lockwashers (525).
(2) Screw the filler pipe (522) into the sump cover (528), and place the fillercap (520) on the filler pipe.
(3) Assemble the thermostat and bracket assembly as follows:
  (*a*) Carefully lower the capillary tube and thermostat bulb down through the hole in the thermostat mounting bracket (500).
  (*b*) Carefully turn the capillary tube fitting (504) into the thermostat mounting bracket (500), and tighten the gland nut on the capillary tube fitting.
  (*c*) Mount heater thermostat switch S808 (501) on the thermostat mounting bracket (500); attach it to the bracket with the four 10 by 32 machine screws (498), the lockwashers (499), and the nuts (inside the switch inclosure).
  (*d*) Now attach the thermostat mounting bracket (500) and the gasket (509) to the sump cover (528) with the four 10 by 24 machine screws (502) and the lockwashers (503).

d. Mount and assemble the pump and motor assembly as follows:

(1) Assemble the spacer (508) and lubrication pump motor B804 (505) to the pump assembly mounting plate (510) with the eight $\frac{3}{8}$-inch capscrews (506) and the lockwashers (507).
(2) Mount the flexible coupling (543) and the key (542) on the shaft of the gear head of lubrication pump motor B804 (505).
(3) Attach the pump bracket (515) to the spacer (508) with the two $\frac{5}{16}$-inch capscrews (519), the lockwashers (518), and the flat washers (517).
(4) Insert the pump shaft into the flexible coupling (543), and attach the pump (546) to the pump bracket (515) with the two $\frac{1}{4}$-inch capscrews (548), the lockwashers (547), and the nuts (514).
(5) Tighten the setscrews (544 and 545) on the upper and lower portion of the flexible coupling (543).
(6) Attach the pump support block (516) to the pump bracket (515) with the two 10 by 24 machine screws (521).
(7) Attach the lower tube connector (549) and the 1-inch by $\frac{3}{4}$-inch reducing bushing (557) to the pump (546). Attach the upper tube connector (550) to the pump assembly mounting plate (510).

(8) Mount the tube assembly (551) and tighten the ferrules on the upper tube connector (550) and the lower tube connector (549).

(9) Mount the gasket (513) and carefully lower the pump and motor assembly into the sump cover (528). Attach the pump and motor assembly to the sump cover (528) with the four $\frac{5}{16}$-inch capscrews (511) and the lockwashers (512).

(10) Insert the $\frac{3}{4}$-inch by $\frac{1}{4}$-inch reducing bushing (560) into the $\frac{3}{4}$-inch cross fitting (559) of the pressure gage and oil discharge assembly. Connect a $\frac{1}{4}$-inch street elbow (561) to the reducing bushing. Connect the gage shutoff (563) to the street elbow with a $\frac{1}{4}$-inch close nipple (562). Connect the gage (564) to the gage shutoff (563). Attach a $\frac{3}{4}$-inch by $\frac{1}{2}$-inch reducing bushing (566) to the $\frac{3}{4}$-inch cross fitting (599). Insert a $\frac{3}{4}$-inch pipe plug (565) into the $\frac{3}{4}$-inch cross fitting (559). With a $\frac{3}{4}$-inch close nipple (558) fitting into the $\frac{3}{4}$-inch cross fitting (559), mount the pressure gage and oil discharge assembly on the pump assembly mounting plate (510).

e. Connect the electrical cable and its conductors to the lubricating pump motor. Attach the cable connections from heaters HR811 and HR812.

8–28. Assembly of King Post to Base Frame
(fig. 8–27)

a. Mount the king post (383) with the sealing ring (494) and the lower roller bearing cone and rollers (495) on the base frame (358), use the twelve 1 by 8 by 3½-inch hexagonal-head capscrews (490), the 24 flat washers (491), the 12 lockwashers (492), and the 12 hexagonal nuts (493) to hold the king post in place. Align the reference marks (para 8–25*d*), and locate the king post accurately with the two dowel pins (496); tighten the capscrews securely.

b. Attach the terminal board bracket (485) to the king post with the two $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head capscrews (482), the lockwashers (483), and the flat washers (484).

c. Attach the relay box bracket (567) to the king post with the two 10 by 24 by $\frac{3}{4}$-inch fillister-head screws (568), the lockwashers (569), and the flat washers (570).

d. Locate the synchro mounting plate (371) on the king post with the two lockpins (489), and secure it in place with the six $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head capscrews (486), the lockwashers (487), and the flat washers (488).

8–29. Assembly of Rotor Assembly
(fig. 8–26)

a. Attach the cam (474) to the main drive gear (468) with the two $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch binder-head machine screws (472) and the lockwashers (473).

b. Slide the bellows (161, fig. 8–9) onto the lower end of the rotor (454, fig. 8–26), and tape it in place.

c. Insert the oil seal (470) in the rotor (454).

d. Mount the main drive gear (468) and the key (469) on the rotor (454), and attach the gear to the rotor with the six $\frac{5}{8}$-inch by 11 by 5-inch hexagonal socket-head capscrews (466) and the lockwashers (467).

e. Insert the oil seal (465) in the rotor (454).

f. Position the synchro drive gear (461) under the main drive gear (468). Pull it in place on the main gear with the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal socket-head capscrews (463) and the lockwashers (464) that secure the two gears together. Tighten these bolts evenly and carefully.

g. Place the oil seal (462) in the dust cover (364), and slide the cover carefully onto the hub of the synchro drive gear (461).

8–30. Assembly of Rotor Assembly to King Post
(figs. 8–25 and 8–26)

a. Slide the dustpan section (379, fig. 8–21) down over the king post (383, fig. 8–27), and attach it to the king post with the six $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews (380, fig. 8–21), the lockwashers (381), and the flat washers (382).

b. Lift the rotor (454, fig. 8–26) by the two screw eyes (475), and lower it carefully over the king post. Be sure that it slides all the way down. If it rotates freely on the lower roller bearing, it is in proper position.

c. Insert the oil seal (460) in the top of the rotor (fig. 8–26).

d. Place the upper roller bearing cone and roller (458) in the top of the rotor (fig. 8–26).

e. Place the shim (453, fig. 8–25) and the bear-

ing retainer ring (452) in the top of the rotor (454), and orient the shim and bearing retainer ring so that the identification marks (para 8–23*a*) are aligned. Fasten the shim (453) and the bearing retainer ring (452) to the king post with the use of the six $\frac{1}{2}$-inch by 13 by $1\frac{1}{2}$-inch hexagonal socket-head capscrews (450) and the lockwashers (451).

Note. On Antenna Pedestal AB–651/FPS–69, a $\frac{5}{8}$-inch diameter hole, 15° off a vertical plane, is present in the bearing retainer ring (452), the shim (453), and the rotor (454). When these parts are correctly oriented, the $\frac{5}{8}$-inch diameter hole should be aligned through the three above parts.

f. Place the oil seal (449) in the oil seal retainer ring (448) and attach this ring to the rotor with the six $\frac{5}{16}$-inch by 18 by $1\frac{3}{4}$-inch hexagonal socket-head capscrews (445), the lockwashers (446), and the flat washers (447). Orient the oil seal retainer ring (448) so that the identification marks (para 8–23*a*) are aligned.

g. Perform the procedures given in (1) through (4) below for Antenna Pedestal AB-876/FPS-71. For Antenna Pedestal AB-651/FPS-69, follow the procedure given in paragraph 8–31.

(1) Place an O-ring gasket (444) in the top of the rotor (fig. 8–25).
(2) Attach the collector ring and cable (443) to the bearing retainer ring (452) with the four 10 by 24 by $\frac{3}{4}$-inch binder-head machine screws (441) and the lockwashers (442).
(3) Attach the brush assembly (438), the spacer (439), and the shim (440) to the oil seal retainer ring (448) with the two 10 by 24 by $1\frac{1}{2}$-inch binder-head machine screws (436) and the lockwashers (437).
(4) Attach the dustpan section (379, fig. 8–26) to the dust cover (364) with the fifteen $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews (455), the lockwashers (456), and the flat washers (457).

8–31. Assembly of Lubrication Oil Sump to Base Frame
(fig. 8–24)

a. Place the lubricating oil sump (434) in position on the base frame (358) and fasten it with the four $\frac{3}{8}$-inch by 16 by $1\frac{1}{4}$-inch hexagonal-head capscrews (431), the lockwashers (432), and the flat washers (433).

b. Fill the lubrication sump as directed in paragraph 2–7*e*.

c. Connect the cable from TB805 and TB806 to terminal board TB807 as the cable markings indicate.

8–32. Assembly of Single-Speed Gear Housing Assembly
(fig. 8–23)

a. Installation of Gear Shaft B and Associated Parts. To install gear shaft B (46) and associated parts, proceed as follows:

(1) Install an internal retaining ring (57), followed by the lower synchro ball bearing (56) and another internal retaining ring (55) in the gear housing (8).
(2) Install the internal retaining ring (52) on the end of gear shaft B (46).
(3) Place spacer B (54) on top of the installed lower synchro ball bearing (56). Place the upper synchro ball bearing (53) on top of spacer B (54), and install gear shaft B (46) through the upper synchro ball bearing (53), spacer B (54), and lower synchro ball bearing (56).
(4) Install the ball bearing cover (51), and secure in place with the three 6 by 32 by $\frac{7}{8}$-inch long flathead screws (50).
(5) Clean spur gear C (49) with lintless cloth and cleaning compound. Dry the gear thoroughly, and then lightly coat the tooth surfaces with Grease, Aircraft and Instrument (GL).
(6) Install spur gear C (49) on the splined portion of gear shaft B (46), and secure in place with an internal retaining ring (48).
(7) Install the upper synchro hub clamp (47) on the synchro flexible coupling (31), mate the synchro flexible coupling (31) to gear shaft B (46), and secure in place by tightening the Allen capscrew on the upper synchro hub clamp (47).

b. Installation of Spur Gear A, Gear Shaft A, and Associated Parts. To install spur gear A (35), gear shaft A (36), and associated parts, proceed as follows:

(1) Install an internal retaining ring (45) followed by the lower resolver ball bearing

(44) and another internal retaining ring (43) in the gear housing (8).

(2) Align the spring pin hole in spur gear A (35) with the mating hole in the end of gear shaft A (36), and pin the gear to the shaft with the spring pin (42).

(3) Place spacer A (41) on top of the installed lower resolver ball bearing (44). Place the upper resolver ball bearing (40) on top of spacer A (41), and install gear shaft A (36) through the upper resolver ball bearing (40), spacer A (41), and the lower resolver ball bearing (44).

(4) Clean spur gear B (39) with lintless cloth and cleaning compound. Dry the gear thoroughly and then lightly coat the tooth surfaces with grease (GL).

(5) Install spur gear B (39) on the splined portion of gear shaft A (36), and secure in place by an internal retaining ring (38).

(6) Install the upper resolver hub clamp (37) on the resolver flexible coupling (20), mate resolver flexible coupling (20) to gear shaft A (36), and secure in place by tightening the Allen capscrew on the upper resolver hub clamp (37).

c. Assembly of Parts Attaching to Vernier Base. To assemble the parts attaching to the vernier base (25), perform the following procedure:

(1) Install the vernier nut (29) on the vernier clamp (22), position the vernier nut and clamp portion between the two raised bosses on the vernier base (25), and install the vernier screw (28) through the indicated parts.

(2) Install an external retaining ring (27) on the end of the vernier screw (28).

8–33. Replacement of Single-Speed Gear Housing Assembly

a. Installation of Single-Speed Gear Housing Assembly on Synchro Mounting Plate A816. To install the single-speed gear housing assembly on synchro mounting plate A816 (9), proceed as follows:

(1) Align the two holes in the gear housing (8) with mating lockpins H866 (14) on synchro mounting plate A816 while properly engaging the teeth of spur gear A (35) with the mating gear.

(2) Secure the gear housing (8) to synchro mounting plate A816 (9) with the use of four $\frac{1}{4}$-inch by 20 by 7.8-inch long hexagonal-head capscrews (12) and the lockwashers (13).

b. Installation of Single-Speed Synchro B802 and Resolver B825 in Gear Housing. To install single-speed synchro B802 (10) and resolver B825 (11) in the gearing housing (8), proceed as follows:

(1) Install the lower synchro hub clamp (30) on the synchro flexible coupling (31).

(2) Align the shaft of single-speed synchro B802 with the synchro hub clamp (30) and mate. Secure single-speed synchro B802 (10) to the gear housing (8); use two synchro clamps (34) with the attaching captive screws (32) and the lockwashers (33).

(3) Secure the synchro shaft to the synchro flexible coupling (31) by tightening the Allen capscrew on the lower synchro hub clamp (30).

(4) Install the lower resolver hub clamp (19) on the resolver flexible coupling (20).

(5) Align the shaft of resolver B825 with the lower resolver hub clamp (19) and mate. Secure resolver B825 (11) to the gear housing (8); use the resolver clamp (26) and the vernier base (25) with the attaching captive screws (23) and the lockwashers (24).

Note. When installing resolver B825 (11), make certain that the vernier clamp (22) encircles the body of the resolver.

(6) Tighten the wingnut (21) on the vernier clamp (22).

(7) Secure the resolver shaft to the resolver flexible coupling (20) by tightening the Allen capscrew on the lower resolver hub clamp (19).

(8) Install the gear housing cover (15) and secure in place with the eight 6 by 32 by $\frac{1}{2}$-inch long slotted screws (16), the lockwashers (17), and the flat washers (18).

(9) Reconnect the leads to the respective terminals on resolver B825 (11) and single-speed synchro B802 (10).

Note. Connections to single-speed synchro B802

are as follows: Lead S1 to terminal S3, lead S2 to terminal S2, and lead S3 to terminal S1.

c. Installation of Dustpan Section A865. If dustpan section A865 is ready for installation (synchro B803 is in place and only the single-speed gear housing was removed), perform the following procedure:

(1) Secure dustpan section A862 (2) to the flange on the gear housing (8) with a $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch long hexagonal-head capscrew (6) and a flat washer (7).
(2) Secure dustpan section A865 (1) in place with the ten $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch long hexagonal-head capscrews (3), the lockwashers (4), and the flat washers (5).
(3) Secure the related portions of dustpan section A865 (1) to the flanges of the gear housing (8) and the housing for 24-speed synchro B803 by using the four $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch long hexagonal-head capscrews (6) and the flat washers (7).

8–34. Assembly of Synchro Housing Assembly MP828
(fig. 8–22)

a. Insert the top ball bearing retainer ring (430) in place in the housing (407).

b. Insert the lower ball bearing (429) and the retainer ring (428).

c. Insert the spacer (427), the upper ball bearing (426), the spacer (425), and gear E shaft assembly (424) in the top of the housing.

d. Slide the coupling flange (423) on the lower end of the gear E shaft assembly (424) and use the retainer ring (422) to hold it in place.

e. Attach the coupling ring (421) to the coupling flange (423) with the retainer ring (420).

f. Insert the synchro (418) with the coupling flange (419) fastened to its shaft into the housing. Insert the two tines on the coupling flange (419) into the slots on the coupling ring (421).

g. Attach the two synchro clamps (417) to the housing with the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head captive screws (416).

h. Attach the cover (415) to the housing with the four 6 by 32 by $\frac{3}{8}$-inch binder-head machine screws (412), the lockwashers (413), and the flat washers (414).

i. Insert the lower ball bearing (411) in the housing and hold it in place with the retainer ring (410).

j. Insert the spacer (409) and the upper ball bearing (408) in the housing.

k. Insert the gears C and D shaft assembly (406) in place and insert the retainer ring (405) in the groove in the lower end of the shaft.

8–35. Assembly of Synchro Housing Assembly to Pedestal
(fig. 8–21)

a. Attach synchro housing assembly MP828 (378) to the synchro mounting plate (371) with the four $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrews (367), the four lockwashers (368), the eight flat washers (369), and the four hexagonal nuts (370). Use the lockpins (372) to properly position the synchro housing assembly on the synchro mounting plate.

b. Connect the cables to the synchro as the tags indicate.

c. Attach the dustpan section (363) to the dust cover (364) with the ten $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews (360), the lockwashers (361), and the flat washers (362).

d. Attach the dustpan sections (363 and 379) to the synchro housing assembly and the single-speed gear housing with the six $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews (365) and the flat washers (366).

8–36. Assembly of Motor and Speed Reducer Base to Base Frame
(fig. 8–20)

Attach the motor and speed reducer base (291) to the base frame (358) with the six $\frac{5}{8}$-inch by 11 by $1\frac{3}{4}$-inch hexagonal-head capscrews (355), the lockwashers (356), and the flat washers (357). Position the base on the base frame with the two $\frac{3}{8}$-inch dowel pins (496).

8–37. Assembly of Speed Reducer
(fig. 8–19)

a. Place the radial roller bearing (348) and the worm radial bearing carrier (344) on the worm shaft (309).

b. Insert the oil seal (346) in the worm radial bearing carrier, and tighten the Allen setscrew (347).

c. Place the shim (345) on the worm bearing

carrier, and insert the shaft and carrier assembly in the housing. Attach the assembly to the housing (353) with the six $\frac{5}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrews (343).

d. Place the shim (336) on the worm thrust bearing carrier (335), and insert the carrier in the housing.

e. Insert the right-hand thrust roller bearing cup and cone (341 and 342), the two spacers (339 and 340), and the left-hand thrust roller bearing cup and cone (337 and 338) on the shaft.

f. Screw the inner locknut (333) on the shaft and hand tighten.

g. Place the lockwasher (334) on the shaft. Screw on the outer locknut (333) and tighten.

h. Place the worm thrust bearing cap shim (332) on the worm thrust bearing cap (331). Insert the cap in the worm thrust bearing carrier (335), and attach both to the housing with the six $\frac{5}{8}$-inch by 11 by $2\frac{1}{4}$-inch hexagonal-head capscrews (330).

i. Remove the hexagonal nuts (327) and the lockwashers (328) from the speed reducer heater (329) and insert the heater in the housing so that the terminal ends of each heater project through the housing. Replace the lockwashers and hexagonal nuts and tighten them.

j. Slide the cone gear (318) onto the gear shaft (319).

k. Tip the housing on its side, and place the gear shaft in the housing with the cone gear in position against the worm shaft.

l. Slide the lower gear-gearing spacer (321) onto the gear shaft.

m. Insert the lower roller bearing cup and cone (325 and 326) over the end of the gear shaft and into the housing.

n. Place the shim (324) on the lower bearing cap (323), and attach the cap to the housing with the six $\frac{5}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrews (322). Tip the housing back onto its base.

o. Place the upper gear-bearing spacer (317) and the grease retainer (316) on the gear shaft.

p. Place the gasket (313) on the upper bearing carrier (312), and attach the upper bearing carrier to the housing with the ten $\frac{5}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrews (310).

q. Insert the upper roller bearing cup and cone (314 and 315) in the upper bearing carrier.

r. Insert the oil seal (308) in the upper bearing cap (306). Place the shim (307) on the upper bearing cap and attach the cap to the upper bearing carrier (312) with the six $\frac{5}{8}$-inch by 11 by $1\frac{5}{8}$-inch hexagonal-head capscrews (305).

s. Screw thermal switch S806 (304) and the oil level gage (351) into the housing and tighten them. Apply teflon tape pipe thread sealer to the threads when installing.

t. Screw the bushing (350) into the housing, and attach the breather cap (349).

u. Attach the filler pipe (300 through 303) and the draincock (352) to the housing. Use teflon pipe thread sealer on the threads when assembling.

8–38. Assembly of Speed Reducer to Motor and Speed Reducer Base

a. Replace the extended grease fitting in the male elbow on top of the speed reducer (fig. 8–11), and face the end of the grease fitting with the Alemite fitting as shown in figure 8–11; then tighten the nut on the male elbow securely.

b. Place the drip pan section (181, fig. 8–10) on the speed reducer (299, fig. 8–18) and lift the speed reducer into position on the motor and speed reducer base (291). Fasten the speed reducer (299) to the base with the four $\frac{7}{8}$-inch by 9 by 5-inch hexagonal-head capscrews (295), the eight flat washers (296), the four lockwashers (297), and the hexagonal nuts (298).

c. Connect the cables to the speed reducer heater and thermal switch S806.

d. Fill the speed reducer with lubricant as directed in paragraph 2–7*e*.

8–39. Assembly of Drive Motor to Motor and Speed Reducer Base

a. If the hubs of the shaft coupling (fig. 8–17) have been removed, assemble them to the shaft as follows:

(1) Place a snapring and seal (parts of the shaft coupling) on the end of the speed reducer worm shaft.
(2) Position the key and hub on the shaft, and gently tap the hub onto the shaft until the face of the hub is flush with the end of the shaft.
(3) Tighten the two setscrews on the hub.
(4) Repeat the procedure given in (1), (2), and (3) above for the drive motor shaft.
(5) Slide the sleeve over the hub onto the drive motor shaft.

b. Place the mounting plates (289 and 290, fig. 8–18) on the motor and speed reducer base (291), and lift the drive motor (288) into position on the plates. The faces of the hubs should be approximately one-eighth inch apart.

c. Loosely attach the drive motor to the motor and speed reducer base with the four ½-inch by 13 by 4-inch hexagonal-head capscrews (284), the eight flat washers (285), four lockwashers (286), and hexagonal nuts (287).

d. Check the alignment of the motor and speed reducer with a straightedge and a taper gage as shown in B, figure 8–17. The distance between hubs should be one-eighth inch. Move the motor to obtain proper alignment, and then tighten the bolts to secure it to the motor and speed reducer base. In some instances, it may be necessary to loosen the speed reducer from the base and turn it slightly to obtain alignment, and then retighten.

e. Pack the hub teeth with grease; force the grease between the hub faces. Completely fill this space to provide a sufficient lubricant reservoir.

f. Slide the sleeve over the hubs, and press the seals in with a blunt tool. Snap in the snaprings; make sure they are fully seated.

8–40. Assembly of Dry-Air Pressure System
(fig. 8–16)

a. Attach the bushing (282), the coupling nipple (281), and the tee (275) to pressure switch S805 (283).

b. Attach the coupling nipple (280) and the cross fitting (279) to the tee (275).

c. Attach the pipe-to-flare tube fitting (278), the relief valve (277), and the pressure gage (276) to the cross fitting (279).

d. Attach the elbow (274) to the tee (275).

e. Attach the flexible dry airhose (273) to the elbow (274) with the gland nut (272).

f. Attach pressure switch S805 (283) to the base frame with the two ¼-inch by 20 by 1¼-inch hexagonal-head capscrews (269), the lockwashers (270), and the flat washers (271).

g. Connect the pressure switch cable to terminal board TB805 as the cable markers indicate.

8–41. Assembly of Unit Heater Z815 and Angle Brackets to Base Frame
(fig. 8–15)

a. Attach the vibration mounts (268) to the heater mounting plate (264) with the eight $\frac{5}{16}$-inch by 18 by ¾-inch flathead machine screws (265), the lockwashers (266), and the hexagonal nuts (267).

b. Attach the heater mounting plate (264) to the base frame with the six ⅜-inch by 16 by 1½-inch hexagonal-head capscrews (261), the lockwashers (262), and the flat washers (263).

c. Attach the unit heater (260) to the vibration mounts (268) with the four ⅜-inch by 16 by ¾-inch hexagonal-head capscrews (257), the lockwashers (258), and the flat washers (259).

Note. The unit must be oriented so that it blows air toward the lubricating oil sump.

d. Attach the eight angle brackets (249–256) to the base frame with the thirty-two $\frac{5}{16}$-inch by 18 by 1¼-inch hexagonal-head capscrews (245), the 64 flat washers (246), the 32 lockwashers (247), and the 32 hexagonal nuts (248).

8–42. Assembly of Drip Pan to Pedestal
(figs. 8–10–8–14)

a. Attach drip pan section MP875 (198, fig. 8–10) to the king post with the four $\frac{5}{16}$-inch by 18 by ⅞-inch hexagonal-head capscrews (203), the lockwashers (204), and the flat washers (205).

b. If heating cables HR815 and HR815 have been disassembled, install as follows:

(1) Prepare the two heating cables (HR815 and HR816) by forming them into a tight spiral approximately 4 inches in diameter. A 4-inch diameter cylinder or mandrel is helpful in forming the cables.

(2) Slide one of the formed heating cables over the oil return pipe line and bend the end loop around the elbow at the bottom of the drip pan (D, fig. 8–13). Use a hose clamp or glass tape to temporarily secure the end coil to the pipe.

(3) Work the coils tightly around the pipes. Leave space between the turns so that the other heating cable can be interwound.

(4) Slide the other formed coil on the pipes in a similar manner so that the two heaters are interwound (B, fig. 8–13). Fasten both cables at the end coil with a hose

clamp or glass tape. Work the cables tightly around the pipe and fittings, making sure that adjacent turns close together.

(5) Remove the temporary hose clamp at the end loop, and wrap the pipe and cable with insulating wrapper. Secure the coils and wrapping with a hose clamp (C, fig. 8–13). Carefully overlap each turn so that the previous turn will be secure.

(6) Wrap the entire length and secure the coils and wrapping with three hose clamps (C, fig. 8–13).

(7) Connect P803 and P804 to J803 and J804, respectively.

c. Assemble the oil return line (234–244, fig. 8–14) that runs between the drip pan and the pump.

d. Assemble the oil supply tube (229–233) between the drip pan and the sump.

e. Place drip pan section MP872 (209, fig. 8–12) in position and attach it to the angle brackets (214) with the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (215), the lockwashers (216), and the flat washers (217).

f. Attach drip pan section MP874 (181) to MP872 (209) with the six $\frac{5}{16}$-inch by 18 by $1\frac{1}{4}$-inch hexagonal-head capscrews (206), the lockwashers (207), and the flat washers (208).

g. Place drip pan section MP869 (21) in position, and attach it to the angle brackets (214) with the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (215), the lockwashers (216), and the flat washers (217).

h. Attach drip pan section MP872 (209) to MP869 (210) with the six $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch hexagonal-head capscrews (211), the lockwashers (212), and the flat washers (213).

i. Attach drip pan section MP869 (210) to drip pan section MP874 (181) with the five $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch hexagonal-head capscrews (206) and one $\frac{5}{16}$-inch by 18 by $1\frac{3}{4}$-inch hexagonal-head capscrew (fig. 8–11), the six lockwashers (207), and the six flat washers (208). The longer capscrew is positioned as shown in figure 8–11 to secure the extended grease fitting bracket.

j. Unscrew the Alemite fitting from the end of the extended grease fitting (fig. 8–11), and replace the male connector in the bracket. Fasten the bracket to drip pan section MP869; use the $\frac{5}{16}$-inch by 18 by $1\frac{3}{4}$-inch hexagonal-head capscrew installed in *i* above, and a flat washer, lockwasher, and $\frac{5}{16}$-inch by 18 hexagonal nut as shown in figure 8–11. Replace the Alemite fitting on the end of the extended grease fitting, securing the end of the extended grease fitting to the bracket as shown in figure 8–11.

k. Move the rotor assembly by hand until one of the holes in the main drive gear is over drip pan section MP874 (181, fig. 8–10), and then attach drip pan section MP874 (181) to MP875 (198) with the three $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews (199), the six flat washers (200), the three lockwashers (201), and the three hexagonal nuts (202).

l. Attach the ring (197) to the pinion gear (192) with the four $\frac{1}{4}$-inch by 20 by $\frac{1}{2}$-inch binder-head machine screws (196), and place the pinion gear (ring down) and the key (193) on the speed reducer shaft. Tighten the $\frac{1}{2}$-inch by 13 by $\frac{7}{8}$-inch setscrew (195) and the $\frac{1}{2}$-inch by 13 by $\frac{3}{8}$-inch setscrew (194) to hold the pinion gear and key in place on the shaft. The shorter setscrew (194) seats against the key (193).

m. Place the oil splash ring (191) on the pinion gear (192), and secure it with the two $\frac{1}{4}$-inch by 20 by $\frac{5}{16}$-inch setscrews (190) in the oil splash ring.

n. Attach the switch bracket (180) to drip pan section MP874 (181) with the two $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch binder-head machine screws (187), the lockwashers (188), and the flat washers (189). Attach the support block (182) to the switch bracket with the two 10 by 24 by $\frac{3}{4}$-inch binder-head machine screws (183), the four flat washers (184), the two lockwashers (185), and the two hexagonal nuts (186). Do not tighten the support fastening hardware.

o. Attach the tube union (228, fig. 8–14) to drip pan section MP874 (181) and the oil supply tube (229).

p. Place the upper oil tube section (223) in position and attach it to the tube union (228) by tightening the compression nut. Attach the tube support (224) to the support block (182, fig. 8–10), and tighten the support block fastening hardware.

q. Mount synchronizing switch S802 (176) on the switch bracket (180) with the three 10 by 24 by $\frac{3}{4}$-inch binder-head machine screws (177), the lockwashers (178), and the flat washers (179). Connect the synchronizing switch cable to terminal board TB805 as the cable markings indicate.

8–43. Assembly of Distribution Box to Base Frame
(fig. 8–2)

a. Hold the distribution box (53) in place and attach it to the base frame (358, fig. 8–20) with the three $\frac{3}{8}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrews (49, fig. 8–2), the lockwashers (48), and the flat washers (47).

b. Attach the four cables of the pedestal wiring system to the back and bottom of the distribution box. Use the holes punched in the distribution box and fasten each stuffing tube with a flat washer and a locknut inside the distribution box. Connect the conductors of the cables to the terminal boards according to the markings.

8–44. Assembly of Shaft Seal Assembly Holder
(fig. 8–9)

a. Assembly of Cover Half Sections and Shaft Seal Assembly Holder.

(1) Place the pedestal cover half sections A845 and A853 (56 and 57, fig. 8–2) in place on the pedestal. They will be attached to the side skins later.
(2) Attach the pointer (175, fig. 8–9) to the pedestal cover half section with the two $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews (172), the lockwashers (173), and the flat washers (174).
(3) Attach the two seal holder plates (169) to one seal holder half (171) with the two $\frac{1}{4}$-inch by 20 by 1-inch fillister-head screws (167) and the four dowel pins (170), and place the seal holder half in position on the cover half sections A845 and A853 (56 and 57). Attach the other seal holder half (168) to the plates (169) with two more $\frac{1}{4}$-inch by 20 by 1-inch fillister-head screws (167) and the four dowel pins (170).
(4) Attach the seal holder halves to the pedestal cover half sections (56 and 57) with the four $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews (164), the lockwashers (165), and the inserts (166).
(5) Insert the oil seal (163) in the shaft seal assembly holder.
(6) Place the eight felts (162) in the assembled seal holder halves one at a time, locating them to make four complete circles. Orient the felts so that the joints in each layer do not correspond to that of the adjacent layer.
(7) Untape the bellows (161) from the rotor and slide it down into position.

b. Assembly of Bellow Retainer Halves, Seal Retainer Halves, and Azimuth Scale.

(1) Attach the bellow retainer halves (159 and 160) to the pedestal cover half sections (56 and 57) with the twelve $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch hexagonal-head capscrews (157) and the lockwashers (158).
(2) Attach the seal retainer halves (155 and 156) to the assembled seal holder halves with the twelve $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch hexagonal-head capscrews (153) and the lockwashers (154).
(3) Use the reference mark made during disassembly (para 8–9*a*) as a guide. Place the two azimuth scale halves (151 and 152) in position on the rotor, and fasten them together with the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{8}$-inch hexagonal-head capscrews (147), the 12 flat washers (148), the 6 lockwashers (149), and the 6 hexagonal nuts (150).

8–45. Assembly Procedure for Triple-Channel Rotary Joint for Antenna Pedestal AB–651/FPS–69
(fig. 9–9).

This procedure requires a minimum working crew of three men and at times entails simultaneous operation at the upper and lower ends of the rotary joint.

a. Assembly of Dome (63) and Tube Assembly (81).

(1) Fit an O-ring gasket (85) into the groove around the lower inside of the upper bearing housing (86).
(2) Fasten the housing end plate (91) to the upper bearing housing (86), use the eight 8 by 32 by $\frac{1}{2}$-inch socket-head screws (94), the No. 8 lockwashers (93), and the No. 8 flat washers (92).
(3) Place the encased seal (83) into the upper bearing housing (86) and orient it so

that the flat surface is against the housing end plate (91).

(4) Place the mating encased seal (82) into the upper bearing housing (86) and orient it so that the flat surface is against the stepped side of the other encased seal (83).

(5) Place the ball bearing (80) into the upper bearing housing (86) and secure it in position with an internal beveled retaining ring (79). Align the circumference of the encased seal (82) with that of the ball bearing (80).

(6) Fit the O-ring gasket (84) in the groove that is located $7\frac{1}{2}$ inches from the upper end of the tube assembly (81).

(7) Slide the upper bearing housing (86) and attaching parts onto the tube assembly (81) until the encased seal (82) rests against its stop.

(8) Slide the bearing spacer (78) onto the tube assembly (81) and into the upper bearing housing so that the smaller diameter end is resting against the ball bearing (80).

(9) Place the ball bearing (77) onto the tube assembly (81), and fit it between the sleeve bearing (78) and the upper bearing housing (86). When properly seated, the exposed side of the ball bearing (77) will be flush with the end of the sleeve bearing (78).

(10) Place the laminated shim (76) against the ball bearing (77) and the end of the sleeve bearing (78) followed by the baffle spacer (75). Secure this entire assembly to the tube assembly (81) with an external beveled retaining ring (74). When correctly assembled and the proper thickness of the laminated shim (76) is determined, the external beveled retaining ring (74) will be properly seated and there will be no end play of the bearing assembly on the tube assembly. Peel the laminated shim (76) in small increments and reassemble to sample the shim thickness.

(11) Place the flange-type retaining ring (53) on the bottom of the upper waveguide transition (49), and secure in place with the external retaining ring (54).

(12) Fit the O-ring gasket (55) on the bottom of the upper waveguide transition (49) just below the external retaining ring (54).

(13) Place the dielectric sleeve (56) in the top of the dome (63).

(14) Fasten the upper waveguide transition (49) to the top of the dome (63); use the six $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (50), the $\frac{1}{4}$-inch lockwashers (51), and the $\frac{1}{4}$-inch flat washers (52). Orient the two aligning identification marks so that they are opposite each other. These marks were placed on the upper waveguide transition (49) and the top of the dome during the disassembly procedure.

(15) To determine the correct thickness of the laminated shim halfset (72) before final assembly of the dome (63) and the tube assembly (81) with attaching bearing assembly, perform the following:

(*a*) Insert the upper end of the tube assembly (81) into the bottom side of the dome (63) until the end of the tube assembly (81) bottoms on the recessed portion of the upper waveguide transition (49).

(*b*) Using an appropriate thickness gage, measure the distance between the upper end of the upper bearing housing (86) and the fastening area on the bottom side of the dome (63). Measure this distance as accurately as possible with a thickness gage, and record the reading.

(*c*) Subtract 0.035 inch from the thickness gage reading obtained in (*b*) above. This final figure, after subtraction, is the correct thickness of the laminated shim halfset (72).

(*d*) Using a micrometer, peel or add the necessary shims to obtain the correct thickness of the laminated shim halfset (72).

(16) Remove the tube assembly (81) from the bottom of the dome (63), and then slide the flange-type retaining ring (87) over the bottom end of the tube assembly (81) and the upper bearing housing (86).

(17) Fit an O-ring gasket (73) into the groove around the bottom of the dome (63). Mate the upper end of the tube assembly (81) with the underside of the dome (63), and fasten together with a laminated shim

halfset (72) between the dome (63) and the upper bearing housing (86); use the six ¼-inch by 20 by 1-inch socket-head screws (90), the ¼-inch lockwashers (89), and the ¼-inch flat washers (88).

b. Installation of Dome (63) and Tube Assembly (81) with Attaching Parts.

(1) Fit the O-ring gasket (444, fig. 8–25) around the top of the rotor. Because of its large diameter and flexibility, insure that the O-ring gasket is correctly seated.

(2) Orient the spacer adapter (70, fig. 9–9) so that the two aligning identification marks are opposite each other, and fasten the spacer adapter (70) to the top of the rotor; use the six $\frac{5}{16}$-inch by 18 by 1½-inch socket-head screws (67), the $\frac{5}{16}$-inch lockwashers (68), and the $\frac{5}{16}$-inch flat washers (69). The aligning identification marks were placed on the parts in paragraph 8–7*a*(8) during the disassembly procedure.

(3) Fit the O-ring gasket (71) into the groove around the top inside of the spacer adapter (70).

(4) Feed the appropriate end of the accessory cable through the ⅝-inch hole (at 15° off a vertical plane) in the bearing retainer ring (452, fig. 8–25). Insure that the accessory cable is relatively straight, and that it protrudes from the bottom of the pedestal.

(5) Before fastening the collector ring (443) to the bearing retainer ring (452), insure that a cable clamp anchors the accessory cable to the underside of the collector ring. When the accessory cable is found to be in order, fasten the collector ring to the bearing retainer ring (452); use the four 10 by 24 by ¾-inch binder-head machine screws (441) and the No. 10 lockwashers (442).

(6) Fasten the brush assembly (438) to the oil seal retainer ring (448); use the two 10 by 24 by 1½-inch binder-head machine screws (436), the two No. 10 lockwashers (437), the one spacer (439), and the one shim (440).

(7) Prepare a sling and lifting device similar to that used during the removal procedure, and make ready to lower the tube assembly (81, fig. 9–9) through the center of the antenna pedestal. Slowly lower the assembly while aligning the notched ring on the bottom of the tube assembly (81) with the accessory cable. To facilitate the tube assembly notch passing the length of the rotary joint, maintain a slight tension on the accessory cable from the bottom of the antenna pedestal. Do not force the tube assembly; if binding occurs, investigate the cause and correct the condition.

(8) Orient the dome (63) so that the two aligning identification marks are opposite each other, and fasten the dome (63) to the spacer adapter (70); use the six $\frac{5}{16}$-inch by 18 by 1¼-inch socket-head screws (64), the $\frac{5}{16}$-inch lockwashers (65), and the $\frac{5}{16}$-inch flat washers (66).

(9) If connections are made to the brush assembly (438, fig. 8–25), perform the procedures given below. If no connections are made to the brush assembly, omit the procedures given in (*a*) through (*c*) below and proceed with (10) below.

(*a*) Secure the cable and attaching fitting to one of the two threaded access holes in the top of the dome (63, fig. 9–9). Wrap teflon tape pipe thread sealer around the fitting threads before installation to maintain a watertight condition.

(*b*) Connect the identified leads through one of the access openings in the dome (63) to the appropriate brush assembly (438, fig. 8–25) contacts.

(*c*) Align the rubber gasket (62, fig. 9–9) with the access cover (61) to the dome (63); use the eight ¼-inch by 20 by ⅞-inch socket-head screws (58), the ¼-inch lockwashers (59), and the ¼-inch flat washers (60).

Note. A pipe plug (57) is used in the dome (63) in the cable threaded access holes when cable connections to the brush assembly (438, fig. 8–25) are not used.

(10) Reconnect the lower end of the accessory cable to terminals 21, 22, 23, and 24 on terminal board TB805. Refasten the cable and cable clamp to the king post.

(11) Check the alignment of the upper wave-

guide transition (49, fig. 9–9) for mating with the waveguide run to the antenna horn. If realignment is necessary, loosen the six ¼-inch by 20 by 1-inch socket-head screws (50), rotate the upper waveguide transition (49) for correct mating with the waveguide run to the antenna horn, and then retighten the six socket-head screws.

c. Installation and Assembly of Main Rf Transmission Line Section (41).

(1) Insert the upper dielectric sleeve (48) in the top of the upper waveguide transition (49). The larger inside diameter is on the bottom, and the smaller inside diameter on the top.

(2) Slide the flange-type retaining ring (45) followed by the external retaining ring (46) over thhe bottom end of the main rf transmission line section (41). Secure the flange-type retaining ring (45) to the main rf transmission line section (41) (just below the large flange at the top) with the external retaining ring (46).

(3) Fit the O-ring gasket (47) in the groove adjacent to the external retaining ring (46) on the tube assembly (81).

(4) Carefully lower the main rf transmission line section (41) with attaching parts down the center of the tube assembly (81), and rotate it so that the two aligning identification marks are opposite each other. Fasten the flange-type retaining ring (45) to the upper waveguide transition (49); use the six 10 by 24 by ⅞-inch socket-head screws (42), the No. 10 lockwashers (43), and the No. 10 flat washers (44).

d. Installation and Assembly of Lower Waveguide Transition (102).

(1) Slide the flange-type retaining ring (96) followed by the external retaining ring (97) over the bottom end of the tube assembly (81). Secure the flange-type retaining ring (96) to the bottom of the tube assembly (81) with the external retaining ring (97).

(2) Fit the O-ring gasket (98) into the groove inside the upper portion of the lower waveguide transition (102).

(3) Fasten the lower waveguide transition (102) to the bottom of the tube assembly (81), through the flange-type retaining ring (96); use the six ¼-inch by 20 by 1-inch hexagonal-head screws (99), the ¼-inch lockwashers (100), and the ¼-inch flat washers (101).

(4) Slide the ball bearing (114) onto the collar bearing (116), and secure it against the flanged end of the collar bearing (116) with the external retaining ring (113).

(5) Install the second external retaining ring (112) on the collar bearing (116) followed by the ball bearing (111) and the third retaining ring (110).

(6) Fit the two preformed O-rings (115) into the two grooves inside the collar bearing (116).

(7) Insert this collar bearing (116) assembly into the bottom of the bearing and choke housing (105), and secure in place with the internal retaining ring (117). When correctly oriented, the flanged end of the collar bearing (116) is exposed.

(8) Fit the O-ring gasket (104) into the groove on the top side of the bearing and choke housing (105), and place the lower dielectric sleeve (103) inside the top opening of the bearing and choke housing (105).

(9) Slide the bearing and choke housing (105) with the attaching parts over the bottom end of the main rf transmission line section (41), and fasten to the underside of the lower waveguide transition (102); use the six 10 by 24 by 1½-inch socket-head screws (108), the No. 10 lockwashers (107), and the No. 10 flat washers (106).

e. Installation and Assembly of IFF and Reference Rf Transmission Line Sections (39, 26, and 25). If the IFF and reference rf transmission line sections (25 and 26) have been removed from the IFF rf transmission line section, outer conductor (39), proceed with (1) below. If the line sections were not separated, omit (1) below and proceed with (2) below.

(1) Lay the IFF rf transmission line section, outer conductor (39) and the IFF rf trans-

mission line section (26) on a flat surface. Install the six spacers (95) on the IFF rf transmission line section (26) and fit them into the recessed areas provided. Use adequate support for the IFF rf transmission line section (26), and slide it into the IFF rf transmission line section, outer conductor (39).

(2) Carefully lower the assembled line sections down through the center of the main rf transmission line section (41) until the top flange of the IFF rf transmission line section, outer conductor (39) is resting on the bottom of the recessed area in the top portion of the main rf transmission line section (41).

(3) Slide the flange-type retaining ring (119) over the bottom end of the IFF rf transmission line section, outer conductor (39), and secure in place with the external retaining ring (120).

f. Installation and Assembly of Adapter (124), Upper Choke (134), and Attaching Parts.

(1) Place the O-ring gasket (118) in the groove on the bottom side of the bearing and choke housing (105). Mate the adapter (124) to the bearing and choke housing (105), and orient it so that the wider inside diameter end of the adapter (124) is toward the bearing and choke housing (105) and the air line fitting (pipe-to-tube adapter (128)) is positioned for convenient connection with the flexible dry airhose (273, fig. 8–16). Fasten the adapter (124, fig. 9–9) to the bearing and choke housing (105); use the six $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (127), the $\frac{1}{4}$-inch lockwashers (126), and the $\frac{1}{4}$-inch flat washers (125).

(2) Thread the pipe-to-tube adapter (128) into the adapter (124) and tighten. Wrap teflon tape pipe thread sealer around the fitting threads before installation to maintain an airtight condition.

(3) Place the sleeve (136) in the top of the conductor housing (138) and make certain that it rests against the machined seat.

(4) Place the sleeve bearing (135) in the top of the conductor housing (138) and check for proper seating.

(5) Place the internal retaining ring (133) in the groove around the upper inside portion of the conductor housing (138).

(6) Position the ball bearing (132) on the upper choke (134), and secure in place with the external retaining ring (131).

(7) Carefully place the upper choke (134) with the attaching parts in the upper end of the conductor housing (138). Do not force this assembly in place. If binding occurs, investigate and correct the obstruction. When correctly seated, the outer edge of the ball bearing (132) should be resting on the internal retaining ring (133).

(8) If the choke assembly (147) and choke body (149) have been disassembled and replacement of either or both parts are required or if the ball bearing (132), the conductor housing (138), or the upper choke (134) are replaced, perform the procedures given in (*a*) through (*g*) below to determine the correct thickness of the special shim (148). If the choke assembly (147) and choke body (149) are not disassembled and the same ball bearing (132), the same conductor housing (138), and the same upper choke (134) are reused, omit the (*a*) through (*g*) below and proceed with (9) below.

(*a*) Measure the X-dimension of the upper choke (134) as shown in figure 8–29 by placing a $1\frac{1}{2}$-inch straightedge across the inside recessed surface of the upper choke and measure the distance from the top outside surface to the straightedge with a depth gage. This dimension will be slightly less than 1 inch. Record the measurement to the nearest thousandth (X dimension). Remove the straightedge.

(*b*) Assemble the choke assembly (147) to the choke body (149) with the *full thickness* of the special shim (148) between the two parts. Do not use sealing compound.

(*c*) Temporarily fasten the flange of the choke body (149) to the bottom flange of the conductor housing (138); use the

three ¼-inch by 20 by 1¼-inch socket-head screws (151), the ¼-inch flat washers (150 and 145), and the ¼-inch by 20 self-locking hexagonal nuts (144) in alternate fastening holes.

(*d*) Use a depth gage and measure the Y-dimension from the top of the upper choke (134) to the top of the choke assembly (147) as shown in figure 8–29. Record this dimension to the nearest thousandth.

Note. The ideal special shim (148) thickness is obtained when the Y-dimension is equal to the X-dimension plus 0.054 inch.

(*e*) Add 0.054 inch to the X-dimension obtained in (*a*) above. Subtract the Y-dimension obtained in (*d*) above from the sum of X plus 0.054 inch. The difference figure is the amount of shim that must be removed from the special shim (148).

(*f*) Disassemble the choke body (149) from the conductor housing (138) and the choke body (149) from the choke assembly (147). Peel the special shim (148) in small increments and repeat (*b*) through (*e*) above until the idealized Y-dimension is obtained within a tolerance of 0.003 inch.

(*g*) After the correct shim thickness has been obtained, clean the mating threads of the choke body (149) and the choke assembly (147) with an antiseize compound (Raytheon part No. 230–1001P1). Apply sealing compound (MIL–S–40083, Ordnance spec.) to the threads of the choke body (149). Thread the choke assembly (147) onto the choke body (149) and tighten.

(9) Carefully mate the upper choke (134) with the flange-type retaining ring (119) on the bottom of the IFF rf transmission line section, outer conductor (39) and fasten together; use the four ¼-inch by 20 by ⅞-inch socket-head screws (121), the ¼-inch lockwashers (122), and the ¼-inch flat washers (123).

g. Installation and Assembly of Conductor Housing (138) and Attaching Parts.

(1) Position the O-ring gasket (146) in the groove on the top side of the choke body (149) flange. Mate the choke body (149) flange with the conductor housing (138). Orient the choke body (149) so that the threaded boss aligns with the IFF jack on the side of the conductor housing (138). Fasten the choke body (149) to the conductor housing (138); use the six ¼-inch by 20 by 1¼-inch socket-head screws (151), the twelve ¼-inch flat washers (150 and 145), and the six ¼-inch by 20 self-locking hexagonal nuts (144).

(2) Fasten the lower IFF contact (141) to the threaded boss on the side of the choke body (149); use an 8 by 32 by ⅞-inch fillister-head screw (143) and a No. 8 lockwasher (142).

(3) Push the upper choke (134) which is attached to the IFF rf transmission line section, outer conductor (39) up until the ball bearing (132) seats in the recessed area on the bottom of the adapter (124).

(4) Place an O-ring gasket (137) in the groove on the top flange of the conductor housing (138). Carefully slide the choke assembly (147) over the IFF rf transmission line section (26), and rotate the conductor housing (138) so that the IFF jack mates conveniently with the IFF cable approach. Fasten the conductor housing (138) to the adapter (124); use the six ¼-inch by 20 by 1¼-inch socket-head screws (140), the twelve ¼-inch flat washers (139 and 130), and the six ¼-inch by 20 self-locking hexagonal nuts (129).

(5) Place the spacer insulator (156) on the reference line section contact (155) and fit into the groove. Place the teflon sleeve (154) into the smaller opening end of the reference line section contact (155).

(6) From the top of the rotary joint, push the IFF rf transmission line section down until the end of the inner conductor is flush with the bottom of the choke body (149). Slide the teflon sleeve (154) end of the reference line section contact over the

reference rf transmission line section (25). The flange end of the teflon sleeve (154) should butt against the IFF rf transmission line section (26).

(7) Fit the O-ring gasket (153) over the connector adapter (157) and fasten to the bottom of the choke body (149); use the three 10 by 24 by $\frac{5}{8}$-inch fillister-head screws (159) and the No. 10 lockwashers (158). When fastening the connector adapter (157) to the choke body (149), the operation should result in pushing the reference and the IFF rf transmission line sections (25 and 26) upward.

(8) Wrap some teflon tape pipe thread sealer on the threads of the pipe plug (152) and thread into the bottom flange of the choke body (149).

h. Installation and Assembly of IFF Rf Transmission Line Adapter (29) and Attaching Parts.

(1) Fit the O-ring gasket (40) in the groove around the outside and lower portion of the end sleeve (38).

(2) Place one of the rubber gaskets (37) on top of the upper end flange of the IFF rf transmission line section, outer conductor (39), and align the mating holes.

(3) Align the pin in the side of the end sleeve (38) with the mating groove inside the upper end of the main rf transmission line section (41). Mate and align the four holes in the end sleeve (38) with the four holes in the top flange on the IFF rf transmission line section, outer conductor (39).

(4) Place a second rubber gasket (37) on top of the end sleeve (38). Slide the IFF rf transmission line adapter (29) over the IFF rf transmission line section (26). Orient the IFF rf transmission line adapter (29) so that the two aligning identification marks are opposite each other. When correctly oriented, the IFF jack should be pointing toward the rf horn. Fasten the flange of the IFF rf transmission line adapter (29) to the top flange of the IFF rf transmission line section, outer conductor (39); use the four 8 by 32 by $\frac{3}{4}$-inch socket-head screws (34), the No. 8 lockwashers, (35), and the No. 8 flat washers (36). The aligning identification marks were placed on the parts in paragraph 8–7*a*(8) during the disassembly procedure.

(5) If the upper IFF contact (31) has been removed from the IFF rf transmission line adapter (29), fasten it in place with an 8 by 32 by $\frac{5}{8}$-inch fillister-head screw (33) and a No. 8 lockwasher (32).

(6) Slide the round rubber section seal (28) over the reference and IFF rf transmission line sections (25 and 26), followed by the packing nut (27). Thread the packing nut (27) onto the IFF rf transmission line adapter (29) until it is handtight. Using an appropriate open end wrench (not pliers), take 1 complete turn on the packing nut (27). Do not overtighten.

(7) Place the locking nut (24), O-ring gasket (160), internal tapered spacer (23), and slotted sleeve (22) over the reference and IFF transmission line sections (25 and 26) in the order mentioned. Orient the internal tapered spacer (23) so that the flat side is against the O-ring gasket (160) and the internal tapered side is against the slotted sleeve (22). Place the O-ring gasket (21) over the threaded portion of jack J807 (15). Place jack J807 (15) and the contact (13) over the ends of the reference and IFF rf transmission line sections (25 and 26). The end of the IFF rf transmission line section (26) should butt against the seat inside jack J807 (15). Fasten jack J807 (15) to the IFF rf transmission line section using the O-ring gaskets (21 and 160), slotted sleeve (22), internal tapered spacer (23), and locking nut (24).

(8) Insert the O-ring gasket (19) followed by the plug (20) in the side of jack J807 (15), and tighten.

(9) Orient the EIA-type angle adapter (12) so that it points toward the reflector and away from the horn. Fasten the EIA-type angle adapter (12) to jack J807 (15) with an O-ring gasket (14) between the two flanges; use the three $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head screws (16), the $\frac{1}{4}$-inch lockwashers (17), and the $\frac{1}{4}$-inch by 20 hexagonal nuts (18).

(10) Fasten the two line section guards (1 and

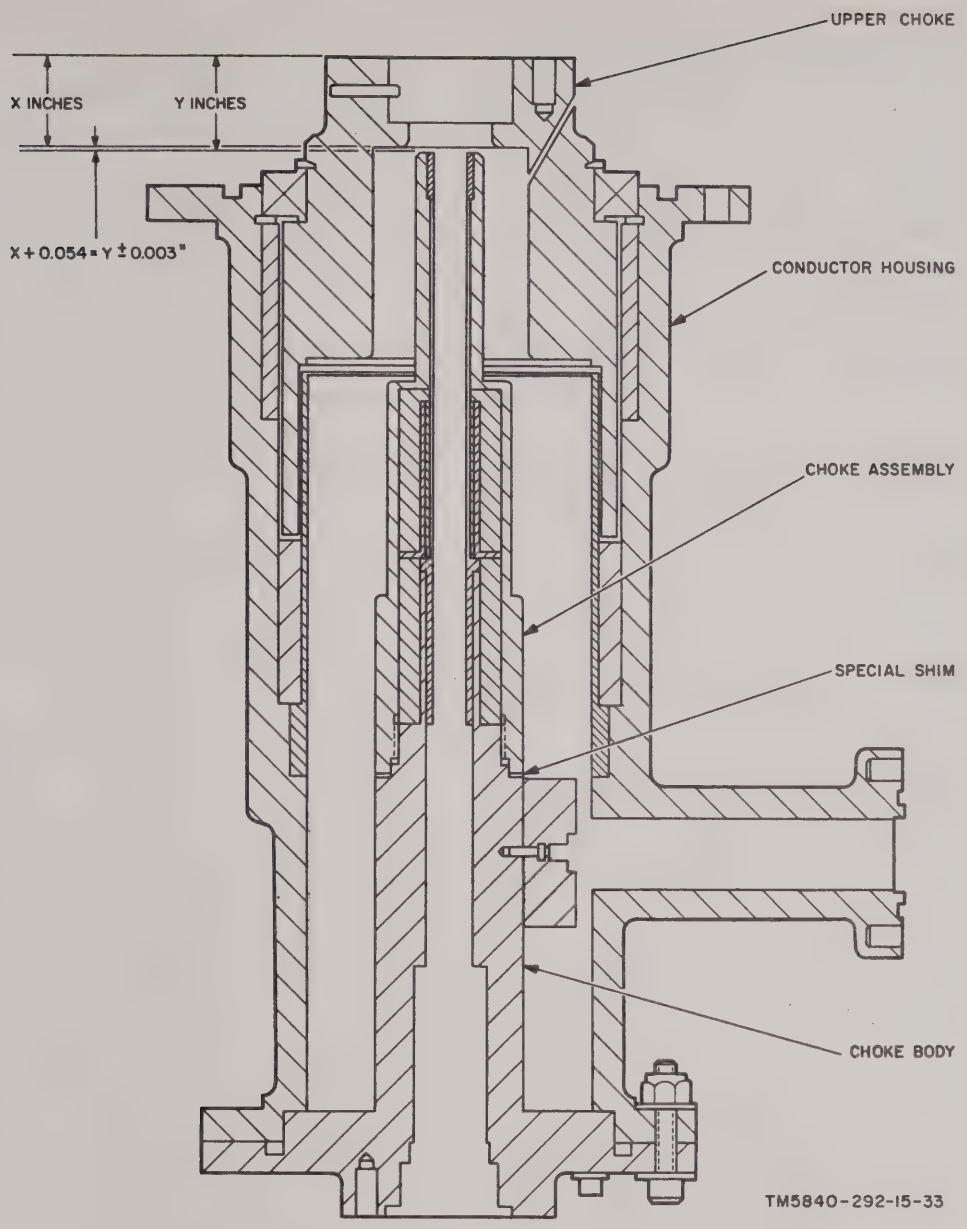


Figure 8–29. Antenna Pedestal AB–651/FPS–69 rotary joint choke assembly, cross section.

2) to the flange on top of the main rf transmission line section (41); use the six ¼-inch by 20 by ¾-inch socket-head screws (8), the ¼-inch lockwashers (9), and the ¼-inch flat washers (10).

(11) Fasten the two line section guards (1 and 2) together; use the four ¼-inch by 20 by ⅞-inch socket-head screws (7), the eight ¼-inch flat washers (6 and 5), the four ¼-inch lockwashers (4), and the four ¼-inch by 20 hexagonal nuts (3).

(12) Connect and fasten plug P807 (of cable W60) to angle adapter CP1000 on top of the rotary joint. Connect and fasten plug P803 (cable W854) to adapter CP1002 (fig. 6–3).

(13) Connect and fasten EIA-type angle adapter CP1013 (between jack J806 and P546

of cable W59) to jack J806 on the bottom of the rotary joint. Connect and fasten EIA-type adapter CP1004 (between J805 and P805 of cable W90) to jack J805 on the bottom of the rotary joint (fig. 6–3).

8–46. Assembly Procedure for Triple-Channel Rotary Joint for Antenna Pedestal AB–876/FPS–71 (fig. 9–10)

This procedure requires a minimum working crew of three men and at times entails simultaneous operations at the upper and the lower ends of the rotary joint.

a. Assembly of Rotary Joint Assembly. Assemble the outer conductor of the rotary joint on the bench by referring to figure 8–8 and performing the following procedures:

(1) Attach the waveguide end section (145, fig. 8–8) and a gasket (146) to the dome assembly with the ten $\frac{5}{16}$-inch by 18 by $\frac{5}{8}$-inch hexagonal socket-head capscrews (143), the lockwashers (144), and the flat washers (497).

(2) Slide the ring (135) and the ball bearing (136) onto the dome assembly shaft and attach the retainer ring (137) to the shaft.

(3) Assemble the cartridge (130) as follows:

(*a*) Insert the oil seal (142) in cartridge A803 (130).

(*b*) Insert the packing ring (140) in the mating ring (141) and place them in the cartridge.

(*c*) Insert the ball bearing (139) and the spacer (138) in the cartridge.

(4) Place the cartridge (130) on the dome assembly shaft and attach it to the ring with the eight $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal socket-head capscrews (133) and the lockwashers (134).

(5) Place the O-ring gasket (132) and the shim (131) on the conductor tube (129), and attach the conductor tube to the cartridge with the eight $\frac{1}{4}$-inch by 20 by 1-inch hexagonal socket-head capscrews (127) and the lockwashers (128).

b. Installation of Rotary Joint Assembly.

(1) Make a sling by wrapping a piece of nylon web strapping around the waveguide sections on the dome assembly, and hook a crane to the sling (fig. 8–7). Raise the assembly and position it over the center of the rotor. Wrap the end of the accessory cable around the lower end of the conductor tube just above the flange to which the lower waveguide transition is to be attached. Tape it in position just above this flange. Be sure that the cable is fitted into the two slots on the conductor tube (fig. 8–5). Carefully lower the rotary joint assembly into the rotor assembly, keeping enough tension on the cable to hold it into the two slots. Continue to lower slowly until the rotary joint assembly is between $1\frac{1}{2}$ to 2 inches above the position where the dome assembly seats on the rotor assembly. Untape the accessory cable and draw all excess cable down under the king post.

(2) Lower the rotary joint assembly completely into the rotor assembly and secure it with the six $\frac{5}{16}$-inch by 18 by $1\frac{1}{2}$-inch hexagonal-head capscrews (102, fig. 8–6), the lockwashers (103), and the flat washers (104).

(3) If an accessory cable entered the dome assembly (105) through a threaded access adjacent to the slipring access cover (fig. 7–10) and connections are to be made to the slipring brush assembly contact, perform the procedures below. If there are no connections to be made to the slipring brush assembly contacts, omit the procedures below and proceed with (4) below.

(*a*) Install the external accessory cable fitting in the threaded access on top of the dome assembly (105, fig. 8–6).

(*b*) Connect the leads to the slipring brush assembly contacts in accordance with the identification tags.

(*c*) Position the slipring access cover and gasket on the dome access opening, and fasten in place with the four socket-head screws and washers, one at each corner.

(4) Connect the four conductors of the accessory cable (part of the slipring assembly, fig. 8–25) to terminals 21, 22, 23, and 24 on terminal board TB805. Fasten the cable in place with a cable clamp and screw.

c. Assembly of Lower Waveguide Transition.

(1) Place a gasket (78, fig. 8–4) on the waveguide end section (99), and attach it to the waveguide transition (77) with the ten $\frac{5}{16}$-inch by 18 by $\frac{5}{8}$-inch hexagonal socket-head capscrews (97), the lockwashers (98), and the flat washers (497).

(2) Place the O-ring gasket (87) on top of the waveguide transition (77).

(3) Fasten the waveguide transition (77) and attached waveguide end section to the bottom flange on the conductor tube with the eight $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal socket-head capscrews (85) and the lockwashers (86). The transition and conductor may be rotated as much as 180° in either direction to facilitate the attachment of the waveguide transition. However, be careful not to rotate the conductor over 180° to prevent damage to the accessory cable.

(4) Fit a new length of indium solder electrical gasket (56, fig. 9–10) into the groove around the outer edge of the lower main transition (55) so that the ends butt against each other but do not overlap.

(5) Place the lower main transition (55) in through the open end of the waveguide transition (57) so that the indium solder electrical gasket rests against the edge of the bottom opening of the waveguide transition.

(6) Align the lower bearing housing (58) on the outside of the waveguide transition (57) with the lower main transition (55) and fasten with the six 8 by 32 by $\frac{5}{8}$-inch socket, flathead, self-locking screws (59). This assembly must be capable of rotating to align associated screw holes.

Note. If the cross section of the O-ring gasket retains a distorted shape due to compression from previous use, or it is damaged during disassembly, replace the O-ring gasket with a new one when reassembling.

(7) Position the O-ring gasket (68) in the groove around the lower flange housing (69).

(8) Fasten the lower flange housing (69) to the lower bearing housing (58) and the lower main transition (55) with the spacer ring (67) in between; use the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket flathead screws (70).

(9) Rotate this entire assembly so that the clearance holes around the outer edge of the lower flange housing (69) align with the tapped holes in the bottom of the waveguide transition (57). Fasten the lower flange housing (69) to the waveguide transition (57) with the twelve $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (73), the $\frac{1}{4}$-inch lockwashers (72), and the $\frac{1}{4}$-inch flat washers (71).

d. Assembly of Upper Waveguide Transition.

(1) Fit a new length of indium solder electrical gasket (52) into the groove around the outer edge of the upper main transition (53) so that the ends butt against each other but do not overlap.

(2) Place the upper main transition (53) in through the open end of the dome assembly (51) so that the indium solder electrical gasket rests against the edge of the upper opening.

(3) Align the upper bearing housing (50) on the outside of the dome assembly (51) with the upper main transition (53), and fasten; use the six 8 by 32 by $\frac{5}{8}$-inch socket, flathead, self-locking screws (49). This assembly must be capable of rotating to align associated screw holes.

(4) Position the O-ring gasket (45) in the groove around the upper flange housing (44).

(5) Fasten the upper flange housing (44) to the upper bearing housing (50) and the upper main transition (53); use the six $\frac{1}{4}$-inch by 20 by $1\frac{3}{4}$-inch socket flathead screws (43).

(6) Rotate this entire assembly so that the clearance holes around the outer edge of the upper flange housing (44) align with the tapped holes in the top of the dome assembly (51). Fasten the upper flange housing (44) to the dome assembly with the twelve $\frac{1}{4}$-inch by 20 by 1-inch socket-head screws (40), the $\frac{1}{4}$-inch lockwashers (41), and the $\frac{1}{4}$-inch flat washers (42).

e. Assembly and Installation of Transmission

Line Sections. If the IFF and reference rf transmission line sections (24 and 25) have been removed from the main rf transmission line section (38), start with (1) below. If the line sections were not separated, omit (1) below and proceed with (2) below.

(1) Lay the main rf transmission line section (38) on a flat surface. Install the six spacers (54) on the IFF rf transmission line section (25) and fit them into the recessed areas provided. Using adequate support for the IFF rf transmission line section, slide it into the main rf transmission line section (38).

(2) Carefully lower the assembled line sections down through the center of the upper and lower main transitions. Reach in through the open end of the waveguide transition (57) and assist in guiding the line sections through the center of the lower main transition (55).

Note. The polyiron spacer (60) is fastened to the lower bearing housing (58) with an epoxy adhesive and is shown for reference purposes only.

(3) Place the two preformed O-rings (63) into the two grooves inside the collar bearing (62).

(4) Place the ball bearing (64) on the collar bearing (62) and fasten in place with the external retaining ring (65).

(5) Slide the positioning spacer (61) over the end of the rf line sections so that the flat surface is against the polyiron spacer (60). Slide the collar bearing (62) and attaching parts over the end of the rf line section so that the widest diameter is toward the positioning spacer (61). Secure this assembly in place with the retaining ring (66) which fits into a groove in the lower bearing housing (58) and rests against the ball bearing (64).

Note. The polyiron spacer (48) is fastened to the upper bearing housing (50) with an epoxy adhesive and is shown for reference purposes only.

(6) Position the sleeve bearing halfset (47) around the main rf transmission line section (38), and place it against the polyiron spacer (48) in the top of the upper bearing housing (50). If necessary, raise the main rf transmission line section (38) to facilitate installation.

(7) Secure the sleeve bearing halfset in place with the retaining ring (46) that fits into a groove in the upper bearing housing (50).

f. Assembly and Installation of Lower Rotary Joint Parts.

(1) Place the locking nut (83), the serrated lockring (85), and the locking ring (86) over the end of the rf line section in the order mentioned. Mate the main transmission line retainer flange (87) with the bottom end of the main transmission line section (38); make certain that the end of the line section butts against the recessed seat in the main transmission line retaining flange (87). Secure the main rf transmission line section (38) to the main transmission line retaining flange (87) with the locking ring (86), the serrated lockring (85), and the locking nut (83). When tightening this assembly, use a $1\frac{1}{4}$-inch open end wrench on the main transmission line retainer flange (87) and a $1\frac{1}{2}$-inch open end wrench on the locking nut (83). Do not use pipe wrenches or pliers when assembling these parts.

(2) Secure the locking nut (83) to the main transmission line retainer flange with the three 8 by 32 by $\frac{1}{4}$-inch socket-head setscrews (84).

(3) Thread the pipe-to-tube adapter (79) into the adapter (78) and tighten. Wrap teflon tape pipe thread sealer around the fitting threads before installation to maintain an airtight condition.

(4) Position the rubber gasket (74) on the smaller flange of the adapter (78). Orient the adapter (78) for convenient connection of the air line (273, fig. 8–16) to the pipe-to-tube adapter (79, fig. 9–9), and fasten the adapter (78) to the lower flange housing (69); use the six $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (77), the $\frac{1}{4}$-inch lock washers (76), and the $\frac{1}{4}$-inch flat washer (75).

(5) Place the sleeve (95) in the top of the conductor housing (99), and make cer-

tain that it rests against the machined seat.

(6) Place the sleeve bearing (94) in the top of the conductor housing (99), and check for proper seating.

(7) Place the retaining ring (92) in the groove around the inside upper portion of the conductor housing (99).

(8) Position the ball bearing (91) on the upper choke (93), and secure to the upper choke with the external retaining ring (90).

(9) Carefully place the upper choke (93) and attaching parts in the upper end of the conductor housing (99). Do not force this assembly into place. If binding occurs, investigate and correct the obstruction. When correctly seated, the outer edge of the ball bearing (91) should be resting on the retaining ring (92).

(10) If the choke assembly (105) and choke body (108) have been disassembled and replacement of either or both parts are required or if the ball bearing (91), the conductor housing (99), or the upper choke (93) is replaced, perform the procedures given in (*a*) through (*e*) below to determine the correct thickness of the special shim (106). If the choke assembly (105) and the choke body (108) are not disassembled and the same ball bearing (91), the same conductor housing (99), and the same upper choke (93) are reused, omit the procedures given below and proceed with (11) below.

(*a*) Assemble the choke assembly (105) to the choke body (108) with the full thickness of the special shim (106) between the two parts. *Do not use sealing compound.*

(*b*) Temporarily fasten the flange of the choke body (108) to the bottom flange of the conductor housing (99); use the three $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (110), the $\frac{1}{4}$-inch flat washers (109 and 104), the $\frac{1}{4}$-inch lockwashers (103), and the $\frac{1}{4}$-inch by 20 hexagonal nuts (102) in alternate holes.

(*c*) Use a depth gage capable of measuring to 0.001-inch accuracy, and measure and record the amount of recess of the choke assembly (105) below the upper choke (93). When the correct shim thickness is obtained, the choke assembly (105) will be recessed below the upper choke (93) by 0.084 inch $\pm$0.003.

(*d*) Disassemble the choke body (108) from the conductor housing (99) and the choke assembly (105) from the choke body (108). Peel the laminated special shim (106), 0.003-inch layer at a time, until the correct thickness is obtained. Repeat (*a*) through (*d*) above until the correct shim thickness has been determined.

(*e*) After the correct shim thickness has been determined, clean the mating threads of the choke body (108) and the choke assembly (105) with an anti-seize compound (Raytheon part No. 230–1001P1). Apply sealing compound (MIL–S–40083, Ordnance spec.) to the threads of the choke body (108). Thread the choke assembly (105) onto the choke body (108) with the special shim (106) between the mating parts, and tighten.

(11) Position the O-ring gasket (107) in the groove on the top side of the choke body (108) flange. Mate the choke body (108) flange with the conductor housing (99). Orient the choke body (108) so that the threaded boss aligns with the IFF jack on the side of the conductor housing. Fasten the choke body (108) to the conductor housing (99); use the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (110), the twelve $\frac{1}{4}$-inch flat washers (109 and 104), the six $\frac{1}{4}$-inch lockwashers (103), and the six $\frac{1}{4}$-inch by 20 hexagonal nuts (102).

(12) Fasten the lower IFF contact (100) to the threaded boss on the side of the choke body (108); use an 8 by 32 by $\frac{7}{8}$-inch fillister-head screw (101).

(13) Place the O-ring gasket (96) in the groove on the top flange of the conductor housing (99). Carefully mate the upper choke (93) with the main transmission line retaining flange (87), and fasten together; use the four 10 by 24 by $\frac{5}{8}$-inch socket-head screws (88) and the No. 10

lockwashers (89). To facilitate installation, the main rf transmission line section (38) may be lowered until the top flange rests on the sleeve bearing halfset (47).

(14) Rotate the conductor housing (99) so that the IFF jack mates conveniently with the IFF cable approach. Fasten the conductor housing (99) to the adapter (78); use the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{2}$-inch socket-head screws (98), the twelve $\frac{1}{4}$-inch flat washers (97 and 82), the six $\frac{1}{4}$-inch lockwashers (81), and the six $\frac{1}{4}$-inch by 20 hexagonal nuts (80).

(15) Place the spacer insulator (115) on the reference line section contact (114), and fit into the groove. Place the teflon sleeve (113) in the smaller opening end of the reference line section contact (114).

(16) From the top of the rotary joint, push the IFF rf transmission line section down until the end of the inner conductor is flush with the bottom of the choke body (108). Slide the teflon sleeve (113) end of the reference line section contact over the reference rf transmission line section (24). The flange end of the teflon sleeve (113) should butt against the IFF rf transmission line section (25).

(17) Fit the O-ring gasket (112) over the connector adapter (116), and fasten the connector adapter (116) to the bottom of the choke body (108); use the three 10 by 24 by $\frac{5}{8}$-inch fillister-head screws (117). When fastening the connector adapter (116) to the choke body (108), the operation should result in pushing the reference and IFF rf transmission line section (24 and 25) upward.

(18) Wrap some teflon tape pipe thread sealer on the threads of the pipe plug (111) and thread into the bottom flange of the choke body (108).

g. Assembly and Installation of Upper Rotary Joint Parts.

(1) Place the rubber gasket (39) on top of the upper flange housing (44), and align the two sets of holes.

(2) Place the rubber gasket (37) on top of the top flange on the main rf transmission line section (38) and align the two sets of holes.

(3) Place the drive housing (36), the rubber gasket (35), and the IFF rf transmission line adapter (28) over the top flange on the main rf transmission line section (38), and align the four sets of holes in each part. Fasten the IFF rf transmission line adapter (28) to the main rf transmission line section (38); use the four 8 by 32 by $\frac{3}{4}$-inch socket-head screws (32), the No. 8 lockwashers (33), and the No. 8 flat washers (34).

(4) If the upper IFF contact (29) has been removed from the IFF rf transmission line adapter (28), fasten it in place with an 8 by 32 by $\frac{5}{8}$-inch fillister-head screw (30).

(5) Align the identification marks on the outer flange edge of the IFF rf transmission line adapter (28) and the mating edge of the drive housing (36). (These marks were placed on the equipment in paragraph 8–8*a*(8).) The IFF rf transmission line adapter (28) should be oriented so that IFF jack projection J803 points toward the rf horn. To prevent the drive housing (36) from rotating, temporarily thread a couple of $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (7) through the drive housing (36) and into the upper flange housing (44). Do not attempt to tighten.

(6) Slide the round rubber section seal (27) over the reference and IFF transmission line sections (24 and 25) followed by the packing nut (26). Thread the packing nut (26) on the IFF rf transmission line adapter (28) until it is handtight. Use the appropriate open end wrench (not pliers), and take 1 complete turn on the packing nut (26). *Do not overtighten.*

(7) Place the locking nut (23), O-ring gasket (118), internal tapered spacer (22), and slotted sleeve (21) over the reference and IFF transmission line section (24 and 25) in the order mentioned. Orient the internal tapered spacer (22) so that the flat side is against the O-ring gasket (118) and the internal tapered side is against the slotted sleeve (21). Place the O-ring gasket (20) over the threaded portion of jack J807

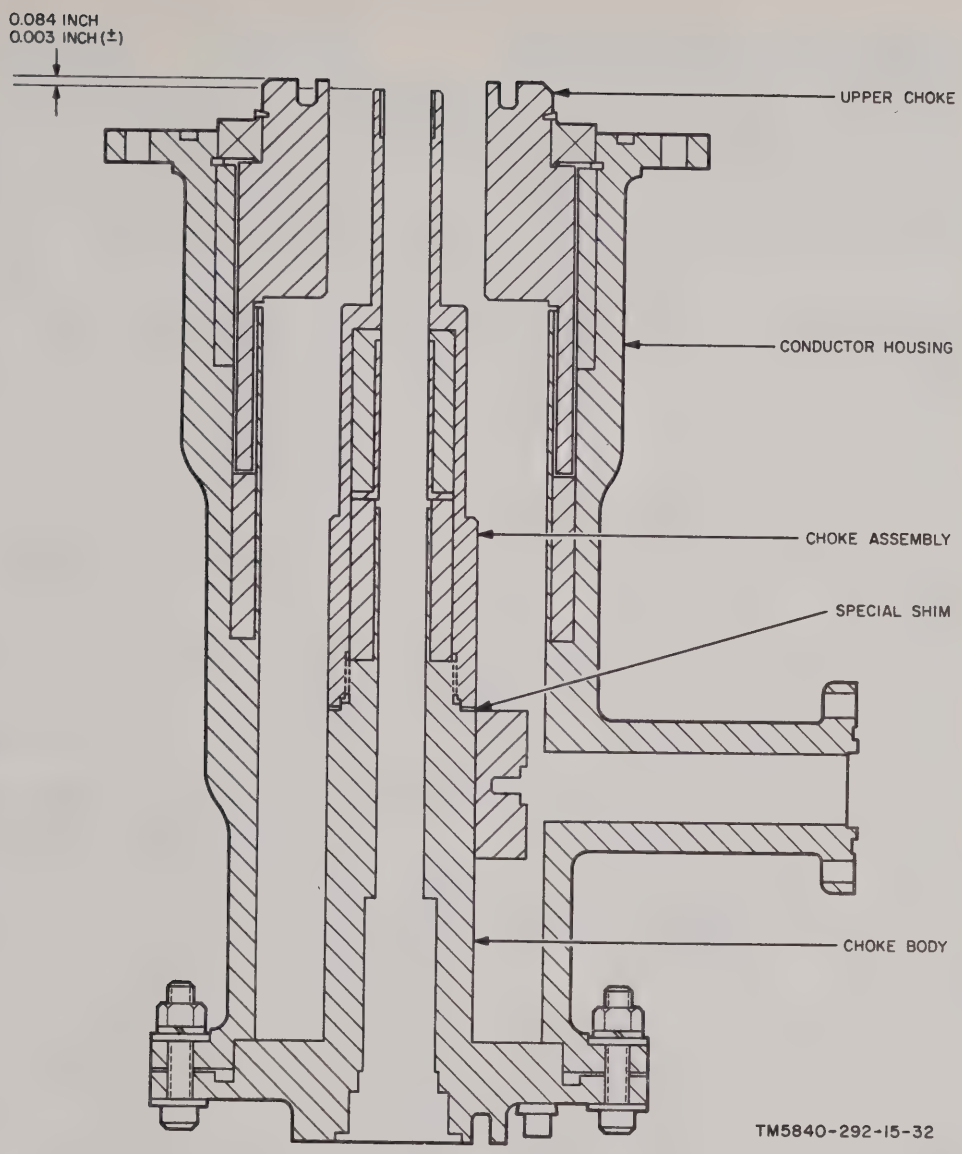


Figure 8–30. Antenna Pedestal AB–876/FPS–71 rotary joint choke assembly, cross section.

(17). Place jack J807 (17) and the contact (12) over the ends of the reference and IFF transmission line sections (24 and 25). The end of the IFF rf transmission line section (25) should butt against the seat inside jack J807 (17). Fasten jack J807 (17) to the IFF rf transmission line sections using the O-ring gaskets (20 and 118), slotted sleeve (21), internal tapered spacer (22), and locking nut (23).

(8) Insert the O-ring gasket (18), followed by the plug (19), in the side of jack J807 (17) and tighten.

(9) Orient the EIA-type angle adapter (11) so that it points toward the center of the reflector and away from the rf horn. Fasten the EIA-type angle adapter (11) to jack J807 (17), with the O-ring gasket (13) between the two flanges; use the three $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head screws (14), the $\frac{1}{4}$-inch lockwashers (15), and the $\frac{1}{4}$-inch by 20 hexagonal nuts (16).

(10) Remove the $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (7) that were temporarily installed in (5) above. Fasten the two line section guards (1 and 2) through the flange of the drive housing (36) to the upper flange housing (44); use the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch socket-head screws (7), the $\frac{1}{4}$-inch lockwashers (8), and the $\frac{1}{4}$-inch flat washers (9).

(11) Fasten the two line section guards (1 and 2) together; use the four $\frac{1}{4}$-inch by 20 by $\frac{7}{8}$-inch socket-head screws (3), the eight $\frac{1}{4}$-inch flat washers (4), the four $\frac{1}{4}$-inch lockwashers (5), and the four $\frac{1}{4}$-inch by 20 hexagonal nuts (6).

(12) Connect and fasten plug P807 (of cable W60) to angle adapter CP1000 on top of the rotary joint. Connect and fasten plug P803 (cable W854) to adapter CP1002 (fig. 6–3).

(13) Connect and fasten EIA-type angle adapter CP1003 (between jack J806 and P546 of cable W59) to jack J806 on the bottom of the rotary joint. Connect and fasten EIA-type adapter CP1004 (between J805 and P805 of cable W90) to jack J805 on the bottom of the rotary joint (fig. 6–3).

8–47. Installation of Waveguide Window to Upper Waveguide Transition

a. Antenna Pedestal AB–651 FPS–69. Fasten the waveguide run (to the antenna horn) to the upper waveguide transition with a waveguide window and pressure regulator and two waveguide gaskets; use the ten $\frac{5}{16}$-inch by 18 by $2\frac{3}{4}$-inch socket-head screws, the lockwashers, and the flat washers as shown in A, figure 2–5. Orient the waveguide window and pressure regulator so that the attached regulator is on the bottom and stenciling on the top (HORN SIDE 5 PSIG) is toward the antenna horn. The ten socket-head screws thread directly into the threaded inserts in the upper waveguide transition flange.

a. Antenna Pedestal AB–651/FPS–71.

(1) Fasten the short waveguide section and special gasket to the upper waveguide transition; use the ten $\frac{5}{16}$-inch by 18 by 1-inch socket-head screws, the lockwashers, and the flat washers as shown in figure 2–6. Orient the special gasket so that the thick portion of the rubber gasket fits against the grooved flange and the narrow portion of the rubber gasket fits against the smooth flange. The ten socket-head screws thread directly into the threaded inserts in the upper waveguide transition flange.

(2) Fasten the waveguide run (to the antenna horn) to the short waveguide section with a waveguide window and two special gaskets between the mating flanges; use the ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screws, the flat washers, and the $\frac{5}{16}$-inch by 18 self-locking hexagonal nuts. Orient the waveguide window so that the pressure side is toward the top of the rotary joint and away from the antenna horn. Orient the special gaskets so that the thick portion of the rubber gasket fits against the grooved flange and the narrow portion of the rubber gasket fits against the smooth flange. The 10 socket-head screws thread directly into the threaded inserts in the upper waveguide transition flange.

8–48. Installation of 3-foot Waveguide Section and Window Assembly

a. Antenna Pedestal AB–651/FPS–69. Fasten the 3-foot waveguide section to the lower waveguide transition with a waveguide window and two waveguide gaskets; use the ten $\frac{5}{16}$-inch by 18 by 2-inch socket-head screws, the lockwashers, and the flat washers as shown in B, figure 2–5. Orient the waveguide window so that the pressure side is toward the lower waveguide transition. The ten socket-head screws thread directly into the threaded inserts in the lower waveguide transition flange.

b. Antenna Pedestal AB–876/FPS–71.

(1) Fasten the short waveguide section to the lower waveguide transition with a special waveguide gasket between the mating flanges; use the ten $\frac{5}{16}$-inch by 18 by 1-inch socket-head screws, the lockwashers, and the flat washers as shown in figure 2–6. Orient the special gasket so that the thick portion of the rubber gasket fits against the grooved flange and the narrow portion of the rubber gasket fits against the smooth flange. The ten socket-head screws thread

directly into the threaded inserts in the lower waveguide transition flange.

(2) Fasten the 3-foot waveguide section to the short waveguide section with a waveguide window and two special waveguide gaskets between the mating flanges; use the ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screws, the flat washers, and the $\frac{5}{16}$-inch by 18 self-locking hexagonal nuts. Orient the waveguide window so that the pressure side is toward the lower waveguide transition. Orient the two special gaskets so that the thick portion of the rubber gasket fits against the grooved flange and the narrow portion of the rubber gasket fits against the smooth flange.

8–49. Assembly of Side Skins to Pedestal

(fig. 8–2)

a. Mount End Skin A861 (46).

(1) Slide end skin A861 (46) into position on the pedestal and attach it to the angle brackets with the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews (45) and the flat washers (44).

(2) Slide the spacer (54) in position between the distribution box (53) and the end skin, and attach the end skin to the distribution box with the four $\frac{1}{4}$-inch by 20 by $\frac{3}{4}$-inch hexagonal-head capscrews (43) and the flat washers (42).

(3) Attach the support bracket (32) to the two angle brackets (33), and attach these brackets (33) to the end skin with the six $\frac{1}{4}$-inch by 20 by $1\frac{1}{4}$-inch hexagonal-head capscrews (31), the 12 flat washers (28), the six lockwashers (29), and the six hexagonal nuts (30).

(4) Attach drip pan section MP874 (181, fig. 8–10) to the support bracket (32, fig. 8–2) on the end skin with the three $\frac{5}{16}$-inch by 18 by $\frac{7}{8}$-inch hexagonal-head capscrews (27), the six flat washers (24), the three lockwashers (25), and the three hexagonal nuts (26).

(5) Attach cover plate A886 (37) to the end skin with the seven $\frac{1}{4}$-inch by 20 by 1-inch hexagonal-head capscrews (36), the lockwashers (35), and the flat washers (34).

(6) Attach the angle (41) to the end skin with the four 10 by 24 by $\frac{5}{8}$-inch hexagonal-head capscrews (40), the lockwashers (39), and the flat washers (38).

(7) Attach the end skin to pedestal cover half section A853 (57) with the ten $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (8), the 20 flat washers (5), the 10 lockwashers (6), and the 10 hexagonal nuts (7).

(8) Place cover A854 (23) on the pedestal cover half section and tighten the fourteen $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screws (22).

b. Mount Side Skin A831 (20).

(1) Place side skin A831 (20) in position and attach it to the butt straps (21) with the eight $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews (18) and the flat washers (19).

(2) Attach side skin A831 to pedestal cover half section A845 (56) with the six $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (8), the 12 flat washers (5), the 6 lockwashers (6), and the 6 hexagonal nuts (7).

c. Mount Side Skin A829 (12).

(1) Attach side skin A829 (12) to the angle brackets, the butt strap (21), and end skin A861 (46) with the seventeen $\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews (10) and the flat washers (11).

(2) Attach side skin A829 to the pedestal cover half sections (56 and 57) with the seven $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (8), the 14 flat washers (5), the 7 lockwashers (6), and the 7 hexagonal nuts (7).

d. Mount Side Skin A827 (9).

(1) Attach the channel assembly (67, fig. 8–3) of the dry-air cylinder holder assembly to side skin A827 (9, fig. 8–2) with the ten $\frac{3}{8}$-inch by 16 by 3-inch hexagonal-head capscrews (66, fig. 8–3), the 20 flat washers (63), the 10 lockwashers (64), and the 10 hexagonal nuts (65).

(2) Attach side skin A827 (9, fig. 8–2) to the angle brackets, the butt strap (21), and end skin A861 (46) with the seventeen

$\frac{5}{16}$-inch by 18 by $\frac{3}{4}$-inch hexagonal-head capscrews (10) and the flat washers (11).

(3) Attach the side skin section to the pedestal cover half section (56 and 57) with the seven $\frac{5}{16}$-inch by 18 by 1-inch hexagonal-head capscrews (8), the 14 flat washers (5), the 7 lockwashers (6), and the 7 hexagonal nuts (7).

e. Fasten the covers (2, 13, and 14) to the side skins with the attached ten $\frac{5}{16}$-inch by 18 by $1\frac{3}{8}$-inch captive screws.

8–50. Installation of Reduced Voltage Starter Box

(fig. 8–1)

a. Installation of Reduced Voltage Starter Box (15).

(1) Use adequate manpower when lifting the reduced voltage starter box. Block the underside of the reduced voltage starter box to support the weight while fastening to the antenna pedestal end skin.

(2) Feed the cable attached to the rear of the reduced voltage starter box through the appropriate access in the side of end skin A861 (46, fig. 8–2). Fasten the reduced voltage starter box to the end skin with the four $\frac{3}{8}$-inch by 16 by 1-inch capscrews (13, fig. 8–1) and the $\frac{3}{8}$-inch lockwashers (14).

b. Connecting Cables.

(1) Connect the appropriate leads, as identified, to terminals T0, T1, T2, and T3 on terminal board TB1 in the reduced voltage starter box.

(2) Remove the protective cover from the junction box on the side of antenna drive motor B801 (fig. 7–3).

(3) Connect the appropriate leads, as identified, to the terminals inside the junction box on the side of antenna drive motor B801.

8–51. Installation of Resolver Amplifier Box

(fig. 8–1)

a. Resolver Amplifier Box (11).

(1) Apply plastic cement (Pliobond No. 20, FSN 80400–20–9190) to one side of the gasket (12) and press firmly to the outside of the side skin so that it will encircle the cable entrance hole. Apply an adequate amount of plastic cement to the exposed side of the gasket.

(2) Secure the resolver amplifier box (11) to the antenna pedestal in sequence as shown in figure 8–1; use the four $\frac{3}{8}$-inch by 16 by 2-inch capscrews (6), the eight $\frac{3}{8}$-inch beveled spacers (7), the four $\frac{3}{8}$-inch flat washers (8), the four $\frac{3}{8}$-inch by 16 self-locking hexagonal nuts (9), and the two sunshade brackets (10). Place the beveled side of the spacer toward the skin of the pedestal. Rotate the eight beveled spacers to compensate for the pedestal curvature, and provide parallel surfaces for the box mounting bracket on the outside and the locknuts on the inside.

(3) Fasten the sunshade (5) to the sunshade brackets (10) with the four $\frac{1}{4}$-inch by 20 by $\frac{5}{8}$-inch panhead screws (2), the $\frac{1}{4}$-inch lockwashers (4), and the $\frac{1}{4}$-inch flat washers (3).

b. Connect plug P827 (18) to jacket J827 (16).

CHAPTER 9

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

9–1. Disassembly

a. Uncabling.

(1) Cable W60 that connects from J1 on the reference antenna to EIA angle adapter CP1000 on the top of the rotary joint may be disconnected at both ends and the loose ends secured to the reflector struts, or the cable may be removed from the reflector and packaged separately.

(2) Disconnect and remove synchro and control cable W81 from the distribution box. Tag and identify the leads before removing.

(3) Disconnect and remove power cable W80 from the distribution box. Tag and identify the leads before removal.

(4) Disconnect and remove adapter CP1004 from jack J805 on the bottom of the rotary joint. This adapter is located between J805 and P805 of cable W90.

(5) Disconnect and remove the angle adapter (located between J806 and P546) from J806 on the bottom of the rotary joint.

b. Reference Antenna and Reflector Assembly.

(1) Secure a rope to the reference antenna for lowering purposes and a second handline for guiding the reference antenna while lowering it. Secure the two lines so that they do not interfere with unfastening and removing the reference antenna from the reference antenna pedestal support.

(2) Loosen and remove the four $\frac{1}{2}$-inch by 13 by $1\frac{1}{2}$-inch capscrews, the lockwashers, and the flat washers that hold the reference antenna to the reference antenna pedestal support. Carefully lower the reference antenna, using the rope while guiding it away from the antenna reflector.

(3) Loosen and remove the hardware holding the reference antenna pedestal support to the antenna reflector struts.

(4) Disconnect cable W854 at CP1002 on top of the rotor assembly and leave it fastened to the horn support.

(5) For Antenna Group OA–4040/FPS–69, perform the following:

(*a*) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by $2\frac{3}{4}$-inch socket-head screws, the lockwashers, and the flat washers that fasten waveguide twist W801 to the upper waveguide transition as shown in A, figure 2–5.

(*b*) Remove the waveguide window and pressure regulator together with the two waveguide gaskets.

(6) For Antenna Group OA–6957/FPS–71, perform the following:

(*a*) Loosen and remove the ten $\frac{5}{16}$-inch by 18 by $2\frac{1}{4}$-inch socket-head screws, the flat washers, and the self-locking hexagonal nuts that fasten waveguide twist W801 to the short waveguide section attached to the waveguide transition as shown in figure 2–6.

(*b*) Remove the waveguide window and the two special waveguide gaskets.

(7) Loosen and disengage the four captive screws (H804–H807) and dismount the horn support.

(8) Attach the waveguide window or the waveguide window and pressure regulator, as the case may be, together with the two gaskets and a protective cover plate to the upper waveguide transition; use the original hardware.

(9) Dismount No. 4 right-hand reflector section E805 from E801 and No. 4 left-hand reflector section E806 from E802 by loosening the eight coupling bolts (E804).

(10) Dismount No. 3 right-hand reflector section E801 from E804 and No. 3 left-hand reflector section E802 from E803.
(11) Dismount No. 2 right-hand reflector section E804 and No. 2 left-hand reflector section E803 from reflector center section E800.
(12) Disengage the four captive bolts (H808–H811) and remove reflector center section E800 from reflector support E807.
(13) Loosen and remove the four bolts and lockwashers that attach reflector support E807 to the rotor assembly. Dismount the reflector support, and replace the bolts and lockwasher in the holes of the support.

c. Rotary Joint for Antenna Pedestal AB–651/FPS–69. A portion of the rotary joint must be removed before shipping to facilitate crating the antenna pedestal and to protect the protrusion beyond the bottom of the pedestal against damage. Refer to figure 9–9 for disassembly for shipping purposes.

(1) Remove the hardware holding the two line section guards (1 and 2) together and to the main rf transmission line section (41).
(2) Loosen the locking nut (24) and remove jack J807 (15) with the attaching EIA-type angle adapter (12).
(3) Loosen the locking nut (24) and remove the hardware that holds the IFF rf transmission line adapter (29) to the end sleeve (38) and remove the IFF rf transmission line adapter (29). Remove the end sleeve (38), the two rubber gaskets (37), and the O-ring gasket (40).
(4) At the bottom of the rotary joint, remove the hardware that holds the conductor housing (138) to the adapter (124), and carefully lower the conductor housing (138) until clear of the transmission lines.
(5) Push down on the IFF rf transmission line section, outer conductor (39) and remove the hardware that holds the flange-type retaining ring (119) to the upper choke (134). Remove the upper choke.
(6) Remove the external retaining ring (120), and remove the flange-type retaining ring (119) from the end of the IFF rf transmission line section, outer conductor (39).
(7) Remove the IFF rf transmission line section, outer conductor (39), with the IFF and reference rf transmission line sections (26 and 25) inside, from the top of the antenna pedestal.

d. Rotary Joint for Antenna Pedestal AB–876/FPS–71. A portion of the rotary joint must be removed before shipping to facilitate crating the antenna pedestal and to protect the protrusion beyond the bottom of the pedestal against damage. Refer to figure 9–10 for disassembly for shipping purposes.

(1) Remove the hardware that holds the two line section guards (1 and 2) together and to the drive housing (36) and the upper flange housing (44).
(2) Loosen the locking nut (23) and remove jack J807 (17) with the attached EIA-type angle adapter (11).
(3) Loosen the packing nut (26) and remove the hardware that holds the IFF rf transmission line adapter (28) to the drive housing (36) and the upper flange housing (44). Slide the IFF rf transmission line adapter (28) off the IFF rf transmission line section (25). Remove the rubber gasket (35), the drive housing (36), and the rubber gasket (37).
(4) Remove retaining ring (46) and the sleeve bearing halfset (47).
(5) At the bottom of the rotary joint, remove the hardware that holds the connector adapter (116) to the choke body (108), and then remove the reference line section contact (114), the teflon sleeve (113), and the O-ring gasket (112).
(6) Remove the hardware that holds the conductor housing (99) to the adapter (78) and lower the conductor housing straight down until clear of the transmission line sections.
(7) Remove the hardware that holds the upper choke (93) to the main transmission line retainer flange (87). Remove the upper choke (93).
(8) Remove the hardware that holds the adapter (78) to the lower flange housing (69). Remove the adapter (78).
(9) Loosen the three socket-head setscrews (84) in the locking nut (83), loosen the

locking nut (83), and remove the main transmission line retaining flange (87) from the bottom of the main rf transmission line section (38).

(10) Remove the retaining ring (66) and the collar bearing (62) with the attaching parts. Remove the positioning spacer (61).

9–2. Repacking for Shipment or Limited Storage

The exact procedure for repacking depends on the material available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 2–2 for the number and sizes of boxes used in the original packing.

a. Coil and tie all the power cable and control cable and cover the loose ends with suitable protective material. If rf cable assembly W60 is removed from the antenna reflector and shipped separately, do not coil the cable smaller than a 2-foot diameter.

(1) Check all the fastening hardware on the 40-foot antenna; tighten those that are loose and replace any missing hardware.

(2) Be sure that all covers on the pedestal are securely tightened, and replace any missing captive screws.

(3) Seal the open ends of the upper and lower portion of the rotary joint against moisture, and protect with padding against mechanical damage.

(4) If the pedestal is to be stored outside, seal all seams with waterproof tape.

(5) Securely mount the pedestal on a skid by using eight bolts through the base frame.

(6) Cover the pedestal with a waterproof paper covering if available.

(7) Crate the pedestal with materials available. A suggested method for crating is shown in figure 2–1.

(8) Wrap the coupling bolts on the reflector sections to protect the threads.

(9) Make sure that all bolts and captive screws on the horn support and reflector support are secured; secure and protect the threads with tape.

(10) Pack the antenna sections in rigid cases.

(11) Pack the waveguide so that the end flanges will not be nicked or gouged and the sides of the waveguide will not be dented.

(12) Construct a rigid box and provide adequate bridging within the box to support the removed portion of the rotary joint. Protect the rotary joint against scratches, nicks, and bending. Pack the rotary joint attaching parts in a separate compartment within the same box and protect the parts against accidental damage. After laying the rotary joint in the box, fasten the securing bridging and the box cover in place with wooden screws. The use of nails could result in damage to the rotary joint by a misguided hammer during packing or unpacking.

(13) Crate the reference antenna and block or pad where necessary to prevent shifting within the crate.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

9–3. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. Use as many of the demolition procedures outlined in paragraph 9–4 as are necessary to prevent the enemy from using or salvaging the equipment.

9–4. Methods of Destruction

a. Smash. Smash the controls, terminal boards, distribution box, transformer, resolver amplifier, reduced voltage starter, relays, gages, tubes, and indicators.

b. Cut. Cut the power cables, interconnecting and signal cables, rf coaxial cables, and oil lines.

c. Burn. Burn cords and technical manuals.

d. Bend. Bend panels, waveguides, antenna reflectors, antenna horn and dipole, reference antenna, lubricating pans, and reflector supports.

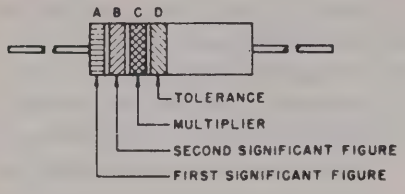
Warning: **Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.**

e. Explode. If explosives are necessary, use grenades or TNT.

f. Dispose. Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them into streams.

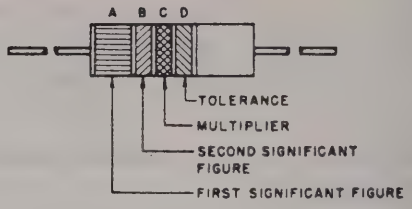
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

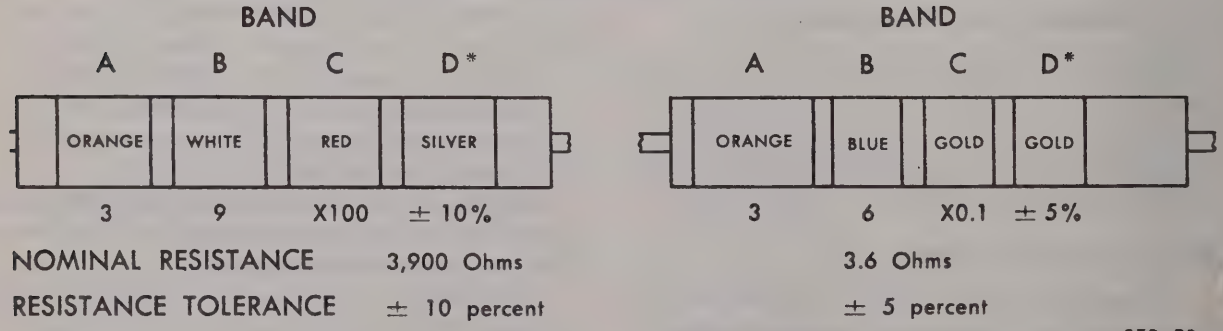


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE	3,900 Ohms	3.6 Ohms
RESISTANCE TOLERANCE	± 10 percent	± 5 percent

STD-R2

*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

Figure 9-1. MIL-STD resistor color code marking.

COLOR CODE TABLES

CY and CB

CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
M	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
		± 20%	± 20%		A				−55° to +70°C	10–55 cps
				B	E		B			
2%		± 2%	± 2%	C		C			−55° to +85°C	
	± 30%			D			D	300		
				E					−55° to +125°C	10–2,000 cps
5%				F				500		
									−55° to +150°C	
		± 5%	± 5%							
0%	± 10%	± 10%	± 10%							

se, Style CK

	CAPACITANCE TOLERANCE	MIL ID
	± 20%	
	± 10%	
		CK

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

ficant (SIG) figures are multiplied to obtain the capacitance in uuf.

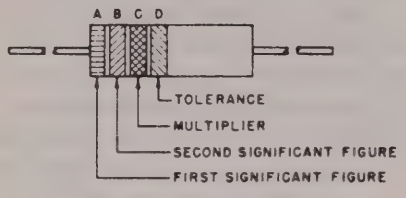
plicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.

temperature limits designated in MIL–C–11015.

ree centigrade.

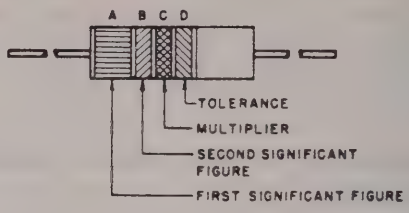
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

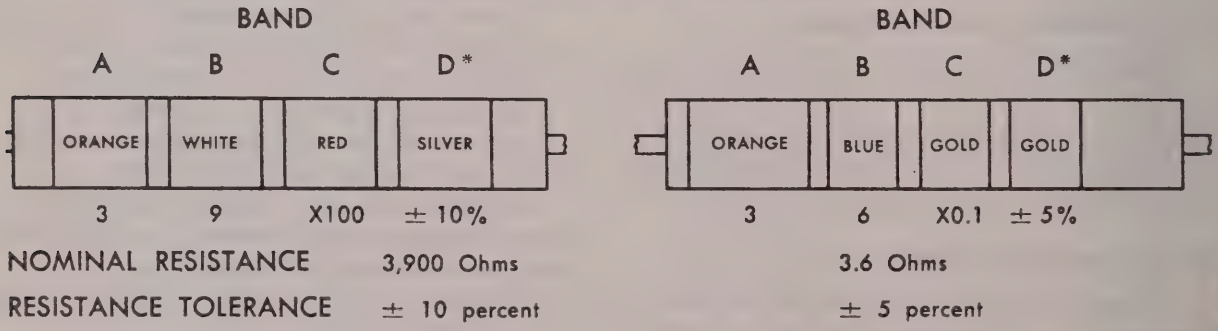


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



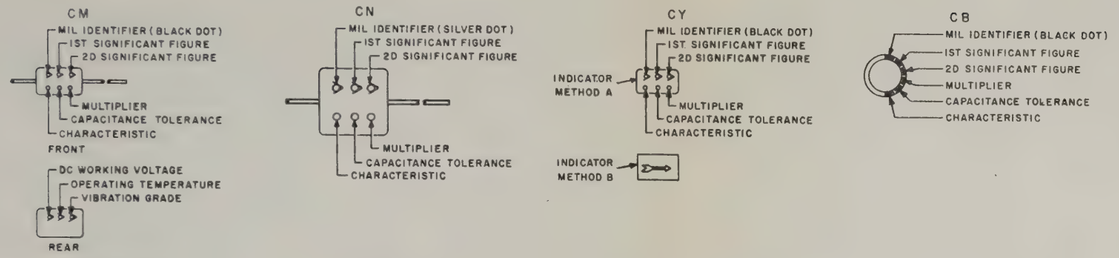
STD-R2

*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

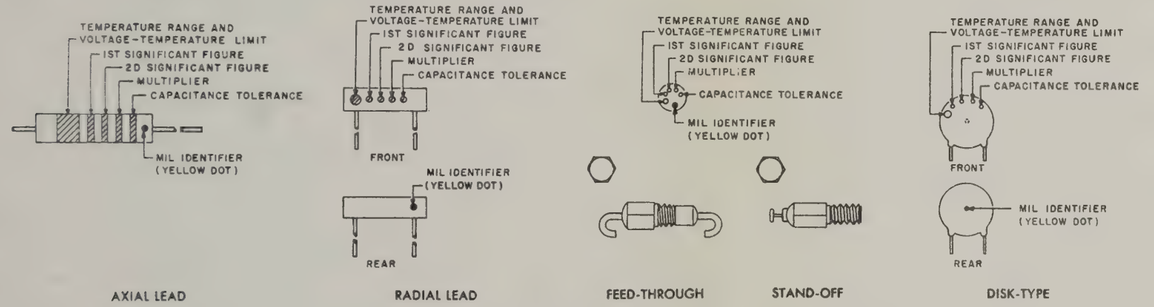
Figure 9-1. MIL-STD resistor color code marking.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

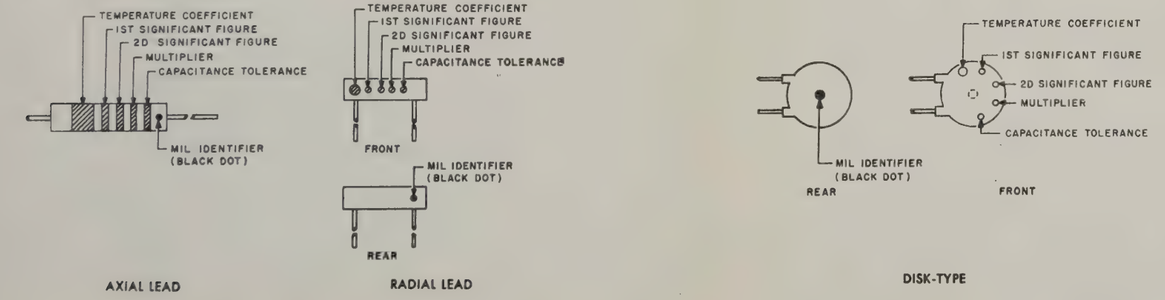
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



TAGO 6591-A

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

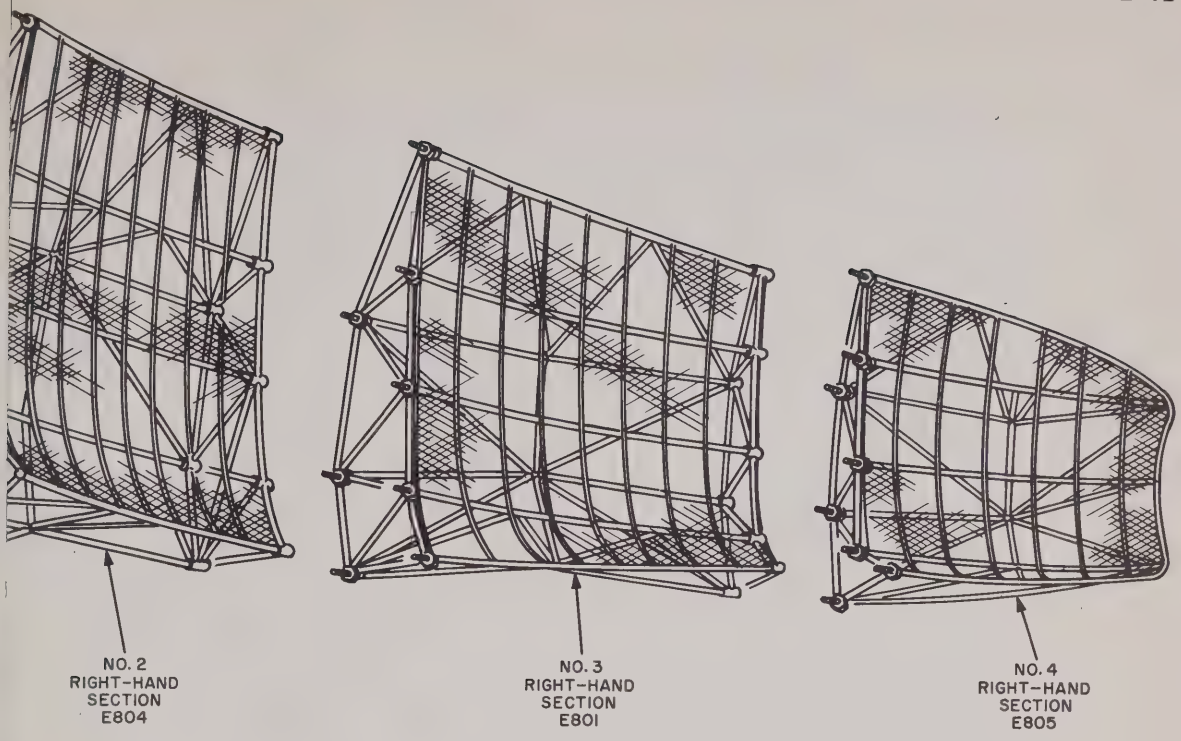
COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

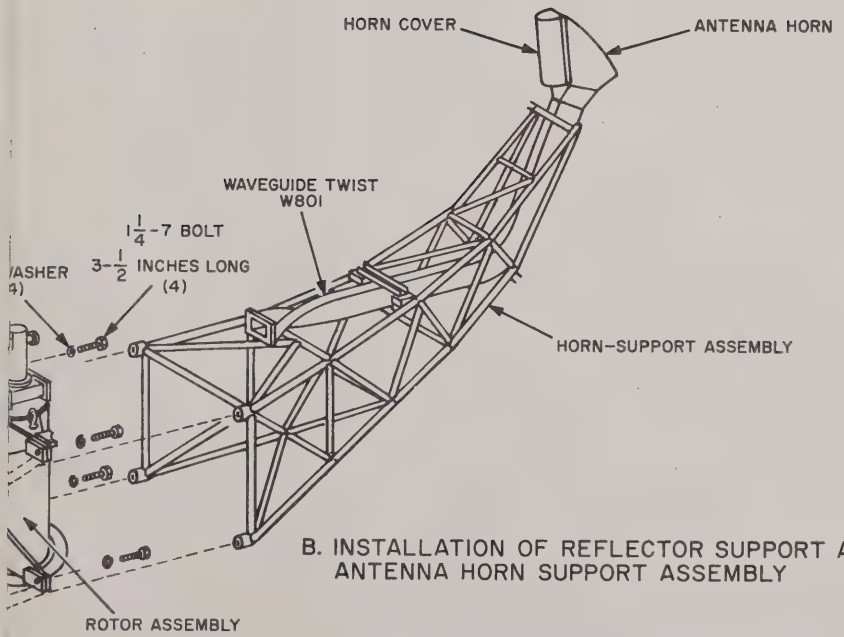
COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL-C-11015.
4. Temperature coefficient in parts per million per degree centigrade.

Figure 9-2. MIL-STD capacitor color code marking.



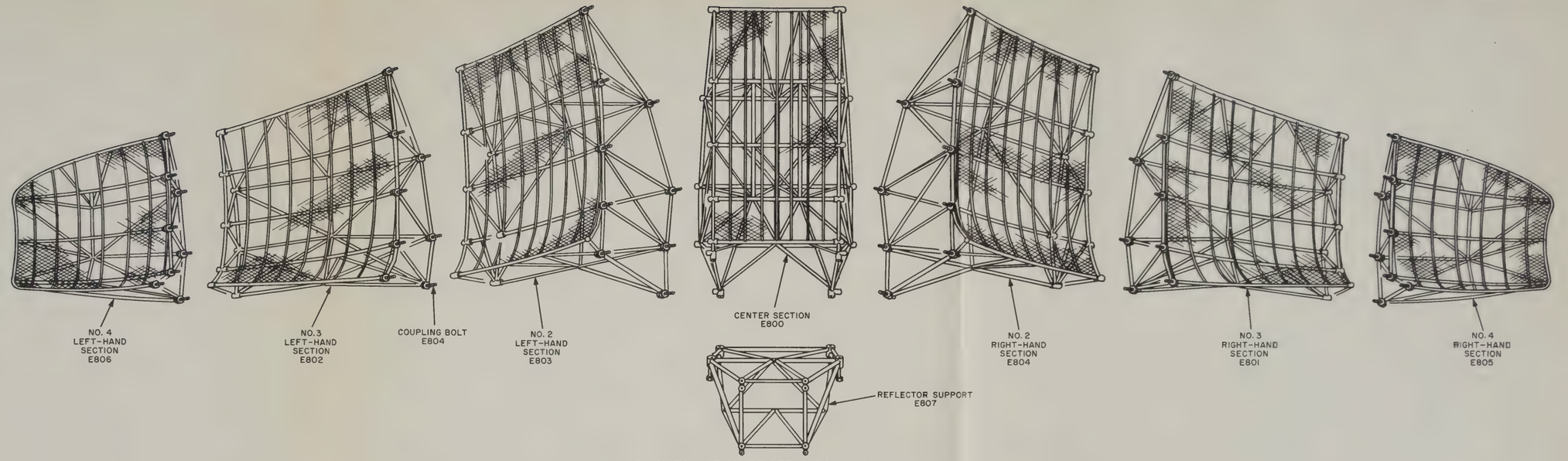
ORT



B. INSTALLATION OF REFLECTOR SUPPORT AND ANTENNA HORN SUPPORT ASSEMBLY

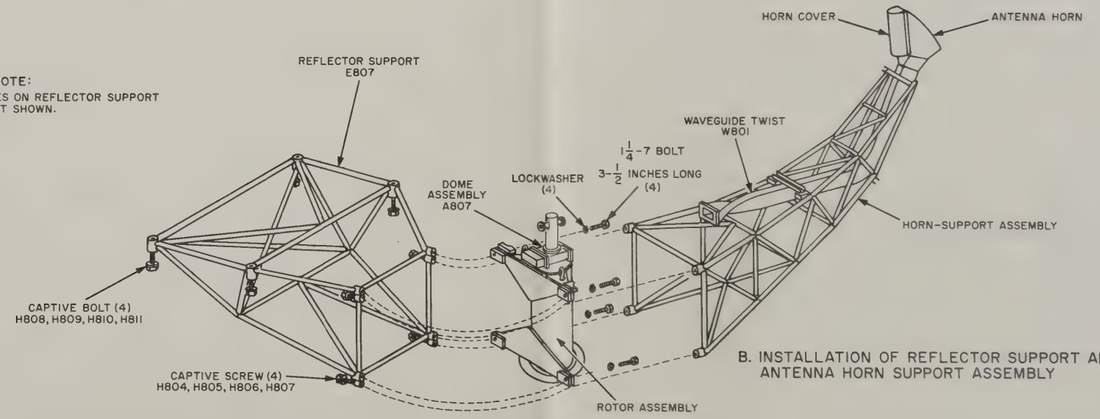
TM5840-292-15-5

g.



A. INSTALLATION OF REFLECTOR ASSEMBLY

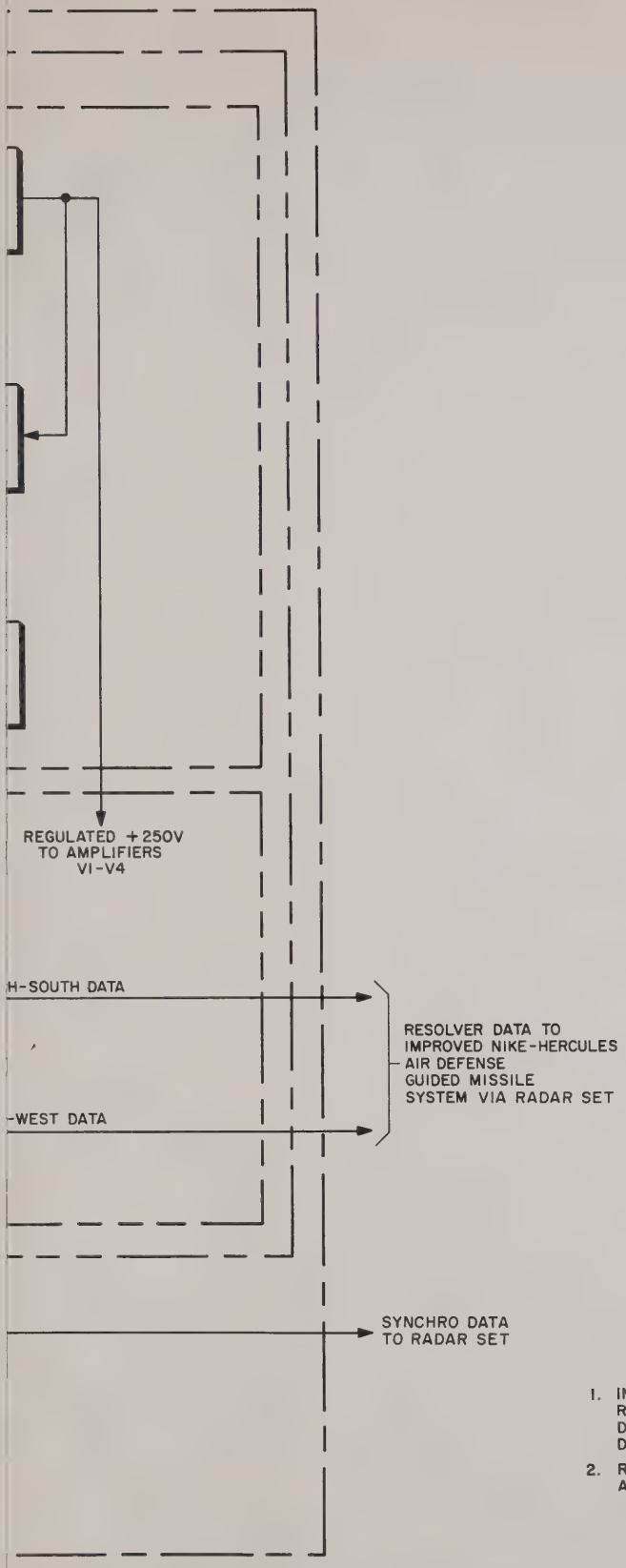
NOTE:
FOR CLARITY ALL BRACES ON REFLECTOR SUPPORT ASSEMBLY E807 ARE NOT SHOWN.



B. INSTALLATION OF REFLECTOR SUPPORT AND ANTENNA HORN SUPPORT ASSEMBLY

TM5840-292-15-5

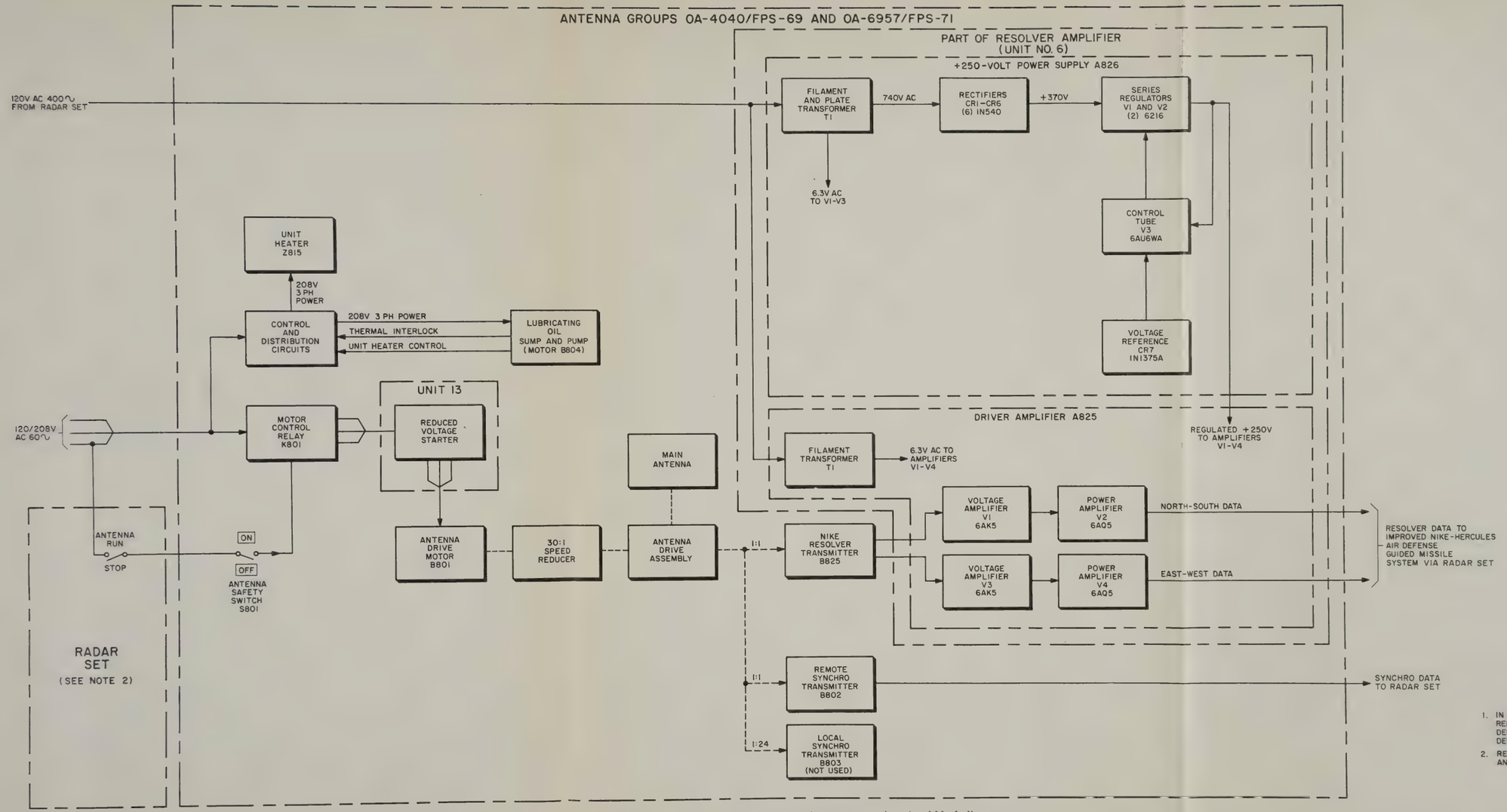
Figure 9-3. Antennas AS-847/FPS and AS-1748/FPS, installation drawing.



NOTES:

1. IN THE COMPONENTS USING THE UNIT NUMBERING SYSTEM, REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH THE UNIT NUMBER AND THE SUBASSEMBLY DESIGNATION.
2. REFER TO APPROPRIATE RADAR MANUAL FOR SWITCHING AND INTERCONNECTING DETAILS.

TM5840-292-15-13



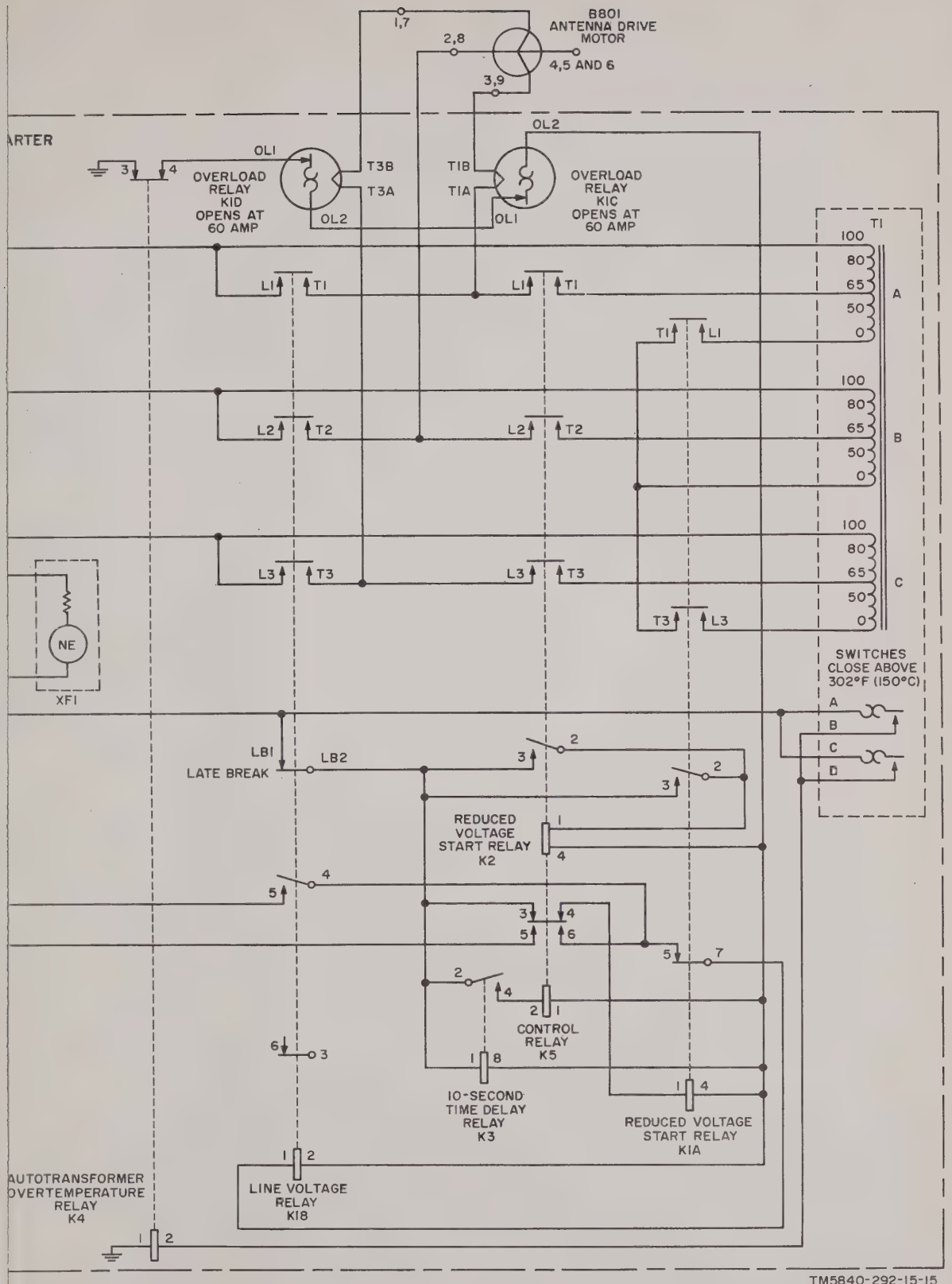
NOTES:

1. IN THE COMPONENTS USING THE UNIT NUMBERING SYSTEM, REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH THE UNIT NUMBER AND THE SUBASSEMBLY DESIGNATION.
2. REFER TO APPROPRIATE RADAR MANUAL FOR SWITCHING AND INTERCONNECTING DETAILS.

TM5840-292-15-13

Figure 9-4. Antenna group, functional block diagram.

TAGO 6591-A


B801
ANTENNA DRIVE
MOTOR
1,7
2,8
3,9
4,5 AND 6
ARTER
OLI
OVERLOAD
RELAY
KID
OPENS AT
60 AMP
T3B
T3A
OL2
TIB
TIA
OLI
OVERLOAD
RELAY
KIC
OPENS AT
60 AMP
TI
100
80
65
50
0
A
B
C
LI
L2
L3
T1
T2
T3
NE
XF1
SWITCHES
CLOSE ABOVE
302°F (150°C)
LBI
LATE BREAK
LB2
REDUCED
VOLTAGE
START RELAY
K2
CONTROL
RELAY
K5
10-SECOND
TIME DELAY
RELAY
K3
REDUCED VOLTAGE
START RELAY
KIA
AUTOTRANSFORMER
OVERTEMPERATURE
RELAY
K4
LINE VOLTAGE
RELAY
KI8
TM5840-292-15-15

ic diagram.

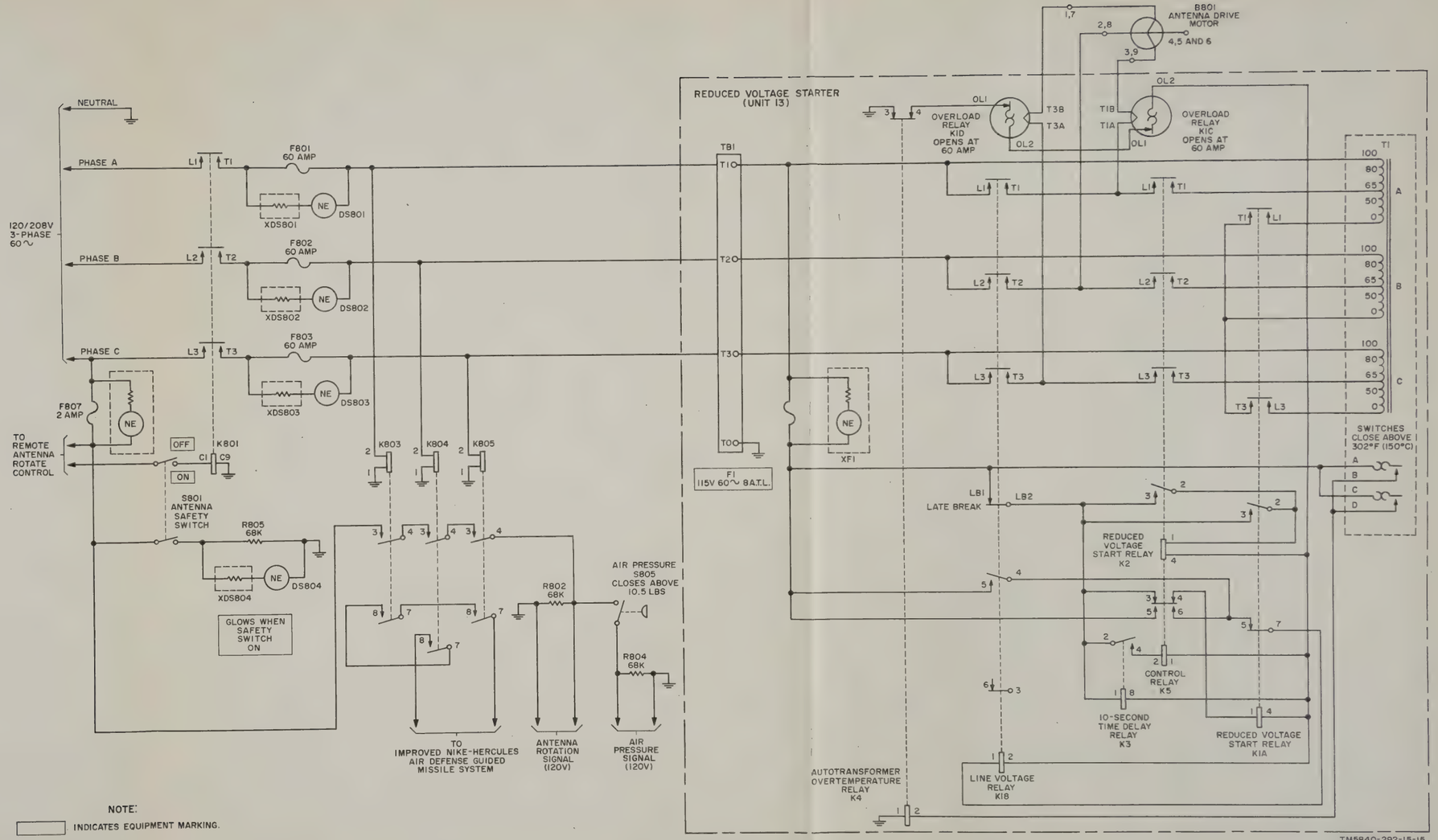
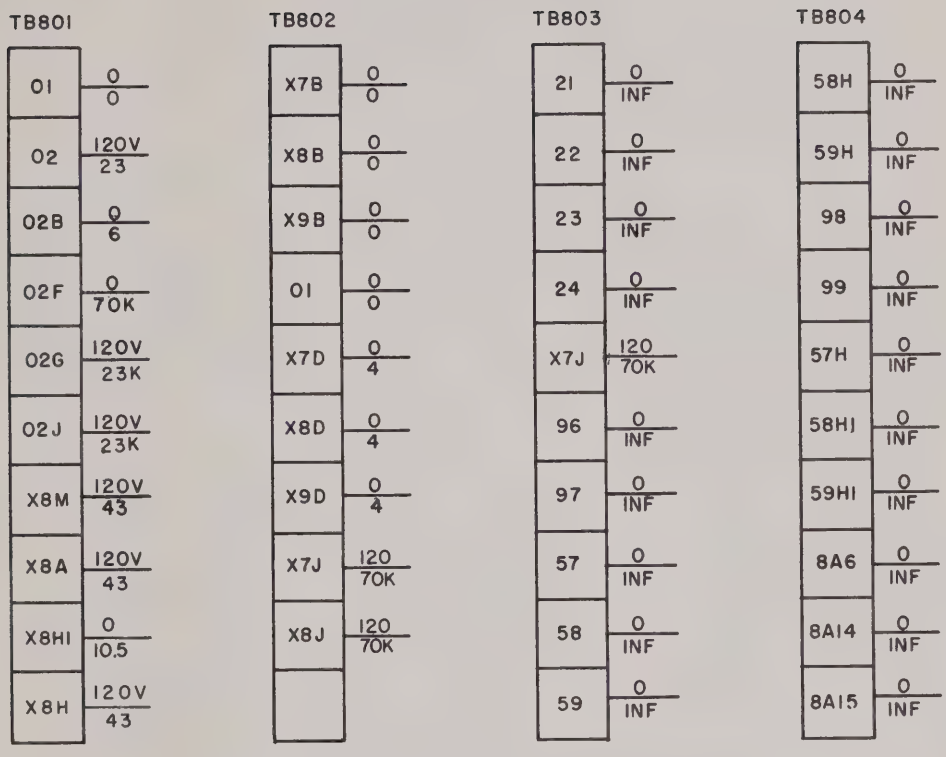


Figure 9-5. Antenna drive motor circuit, schematic diagram.



NOTES:

1. ALL READINGS TAKEN TO CHASSIS WITH 20,000 OHMS-PER-VOLT METER.
2. RESISTANCE READINGS TAKEN WITH ALL EXTERNAL CABLES DISCONNECTED.
4. VOLTAGE READINGS ARE AC AND TAKEN WITH POWER INPUT CABLE ONLY CONNECTED.
5. READINGS TAKEN WITH S801 IN CLOSED (ON) POSITION.
6. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.
7. INF DENOTES INFINITY.

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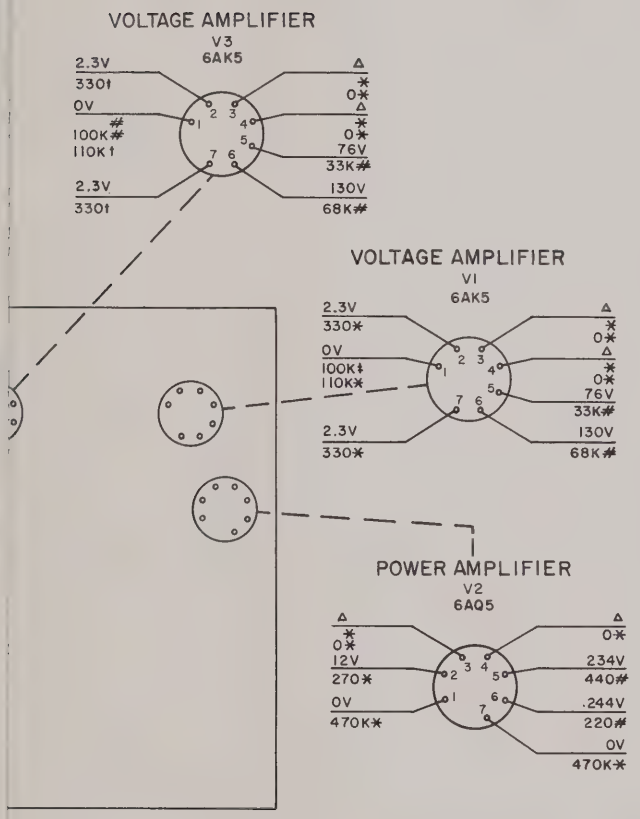
Figure 9-6. Terminal board voltage and resistance measurements.



NOTES:

1. RESISTANCE MEASUREMENTS TAKEN BETWEEN POINTS AS INDICATED WITH MULTIMETER TS-352B/U (20,000 OHMS-PER-VOLT).
2. METER SCALE (RESISTANCE): SCALE THAT GIVES NEAREST TO ONE-HALF DEFLECTION.
3. RESISTANCE MEASUREMENTS TAKEN WITH PLUG P825 REMOVE FROM CHASSIS.
4. * MEASURED TO TERMINAL 2 OF TRANSFORMER T2.
5. † MEASURED TO TERMINAL 2 OF TRANSFORMER T12.
6. # MEASURED TO PIN 8 OF PLUG P1.
7. * MEASURED TO CHASSIS.
8. ‡ MEASURED TO PIN 1 OF PLUG P1.
9. # MEASURED TO PIN 2 OF PLUG P1.
10. VOLTAGE MEASUREMENT TAKEN TO GROUND WITH MULTIMETER TS-352B/U (20,000 OHMS-PER-VOLT) AND ARE POSITIVE DC UNLESS OTHERWISE INDICATED.
11. METER SCALE (VOLTAGE): HIGHEST SCALE THAT GIVES NEAREST TO ONE-THIRD DEFLECTION.
12. Δ INDICATES 6.3 VAC MEASURED BETWEEN PINS SO MARKED.
13. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.
14. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A825.

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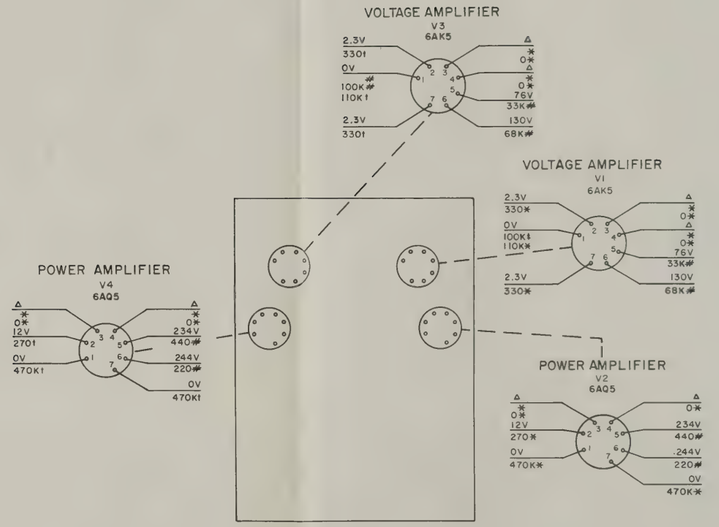
Figure 9-7. Driver amplifier 6A825, voltage and resistance measurements.



NOTES:

1. RESISTANCE MEASUREMENTS TAKEN BETWEEN POINTS AS INDICATED WITH MULTIMETER TS-352B/U (20,000 OHMS-PER-VOLT).
2. METER SCALE (RESISTANCE): SCALE THAT GIVES NEAREST TO ONE-HALF DEFLECTION.
3. RESISTANCE MEASUREMENTS TAKEN WITH PLUG P825 REMOVE FROM CHASSIS.
4. * MEASURED TO TERMINAL 2 OF TRANSFORMER T2.
5. ‡ MEASURED TO TERMINAL 2 OF TRANSFORMER T12.
6. # MEASURED TO PIN 8 OF PLUG P1.
7. * MEASURED TO CHASSIS.
8. ‡ MEASURED TO PIN 1 OF PLUG P1.
9. # MEASURED TO PIN 2 OF PLUG P1.
10. VOLTAGE MEASUREMENT TAKEN TO GROUND WITH MULTIMETER TS-352B/U (20,000 OHMS-PER-VOLT) AND ARE POSITIVE DC UNLESS OTHERWISE INDICATED.
11. METER SCALE (VOLTAGE): HIGHEST SCALE THAT GIVES NEAREST TO ONE-THIRD DEFLECTION.
12. △ INDICATES 6.3 VAC MEASURED BETWEEN PINS SO MARKED.
13. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.
14. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A825.

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Figure 9-7. Driver amplifier 6A825, voltage and resistance measurements.

NOTES:

1. VOLTAGE AND RESISTANCE MEASUREMENTS TAKEN TO GROUND WITH MULTIMETER TS-352B/U (20,000 OHMS-PER-VOLT) UNLESS OTHERWISE INDICATED.
2. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.
3. METER SCALE (VOLTAGE): HIGHEST SCALE THAT GIVES NEAREST TO ONE-THIRD DEFLECTION.
4. METER SCALE (RESISTANCE): SCALE THAT GIVES NEAREST TO ONE-HALF DEFLECTION.
5. RESISTANCE MEASUREMENTS TAKEN WITH OUTPUT DISCONNECTED AT TERMINALS 3 AND 5 OF TB1, A JUMPER LEAD CONNECTED FROM THE JUNCTION OF CR3 AND CR4 TO GROUND, AND A JUMPER LEAD CONNECTED FROM PIN 7 OF A826V3 TO GROUND.
6. ALL MEASUREMENTS TAKEN WITH R1 ADJUSTED TO PROVIDE +250 VOLTS AT THE OUTPUT (TERMINALS 3 AND 5 OF TB1).
7. NC DENOTES NO CONNECTION.
8. VOLTAGES ARE POSITIVE DC UNLESS OTHERWISE SPECIFIED.
9. † INDICATES 6.3V AC BETWEEN PINS SO MARKED.
10. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A826.
11. * INDICATES +250 VOLTS BETWEEN FILAMENT TERMINALS AND GROUND.
12. ϕ INDICATES +100 VOLTS BETWEEN FILAMENT TERMINALS AND GROUND.

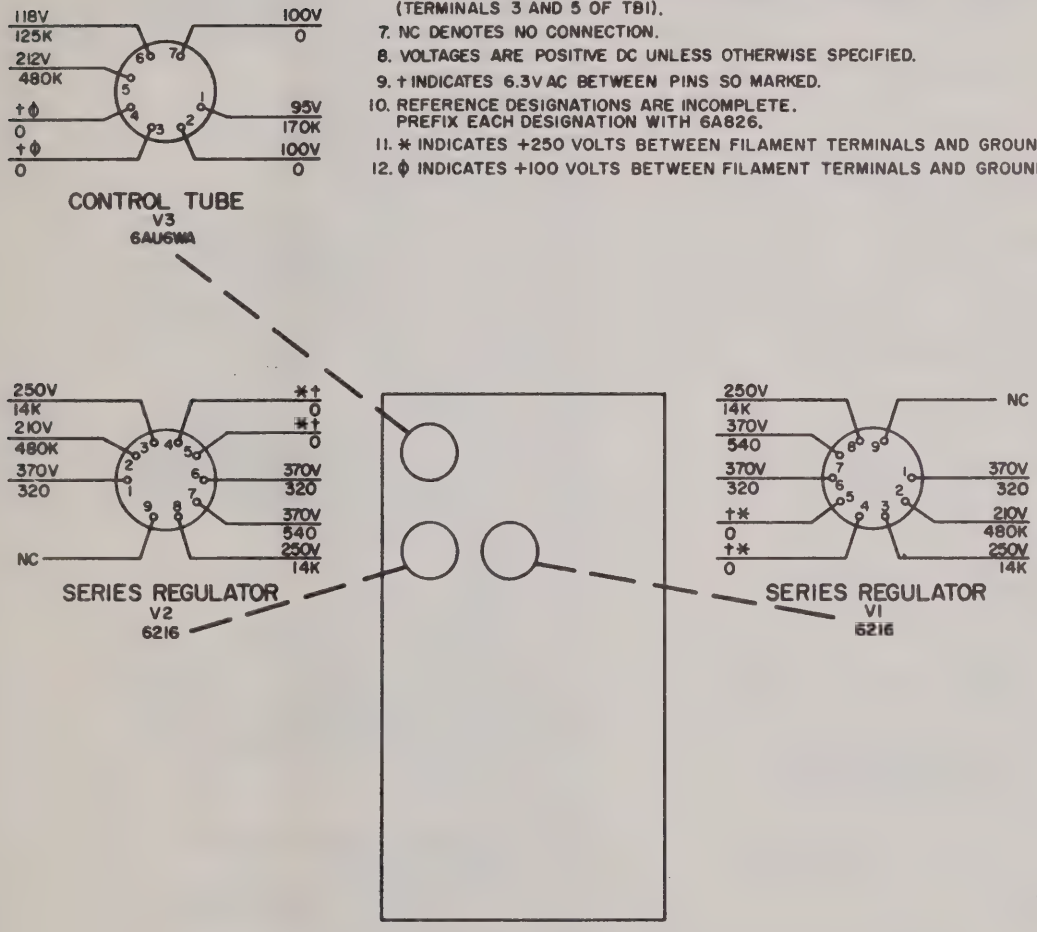
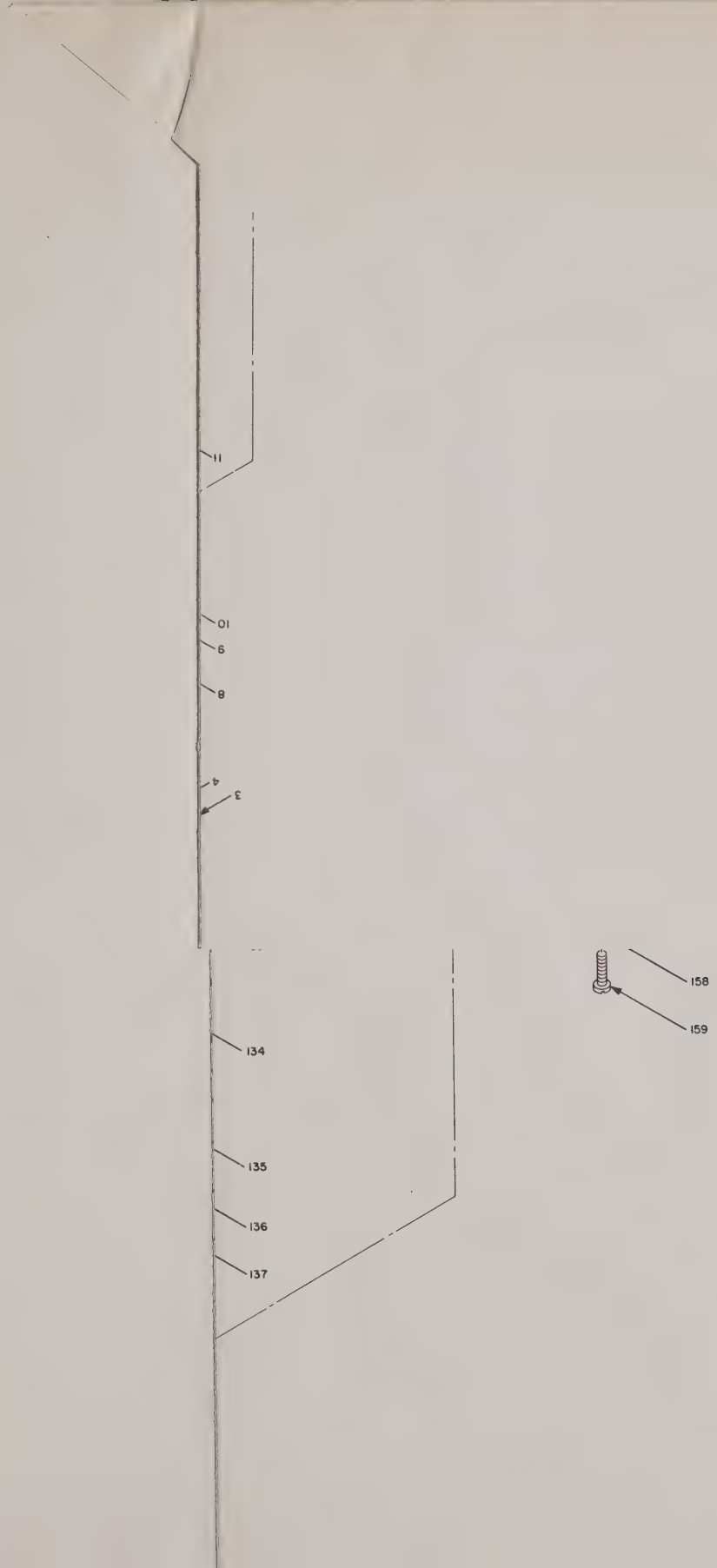


Figure 9-8. Power supply 6A826, voltage and resistance measurements.

1 Line section guard (A)
2 Line section guard (B)
3 ¼-inch by 20 hexagonal nut (4)
4 ¼-inch lockwasher (4)
5 ¼-inch flat washer (4)
6 ¼-inch flat washer (4)
7 ¼-inch by 20 by ⅞-inch socket-head screw (4)
8 ¼-inch by 20 by ¾-inch socket-head screw (6)
9 ¼-inch lockwasher (6)
10 ¼-inch flat washer (6)
11 O-ring gasket
12 EIA-type angle adapter (CP1000)
13 Contact (J807)
14 O-ring gasket
15 Jack J807
16 ¼-inch by 20 by 1-inch hexagonal-head screw (3)
17 ¼-inch lockwasher (3)
18 ¼-inch by 20 hexagonal nut (3)
19 O-ring gasket
20 Plug
21 O-ring gasket (i.d. 0.375 inch)
22 Slotted sleeve
23 Internal tapered spacer
24 Locking nut
25 Reference rf transmission line section
26 IFF rf transmission line section
27 Packing nut
28 Round rubber section seal
29 IFF rf transmission line adapter
30 O-ring gasket
31 Upper IFF contact
32 No. 8 lockwasher
33 8 by 32 by ⅝-inch fillister-head screw
34 8 by 32 by ¾-inch socket-head screw (4)
35 No. 8 lockwasher (4)
36 No. 8 flat washer(4)
37 Rubber gasket (OD 2.0 inches) (2)
38 End sleeve
39 IFF rf transmission line section, outer conductor
40 O-ring gasket (special, ID 2.234 inches)
41 Main rf transmission line section
42 10 by 24 by ⅞-inch socket-head screw (6)
43 No. 10 lockwasher (6)
44 No. 10 flat washer (6)
45 Flange-type retaining ring (ID 3.625 inches)
46 External retaining ring (ID 2.817 inches)
47 O-ring gasket (special, ID 2.608 inches)
48 Upper dielectric sleeve
49 Upper waveguide transition
50 ¼-inch by 20 by 1-inch socket-head screw (6)
51 ¼-inch lockwasher (6)
52 ¼-inch flat washer (6)
53 Flange-type retaining ring (ID 5.125 inches)
54 External retaining ring (ID 4.208 inches)
55 O-ring gasket (special, ID 4.109 inches)
56 Dielectric sleeve
57 Pipe plug (2)
58 ¼-inch by 20 by ⅞-inch socket-head screw (16)
59 ¼-inch lockwasher (16)
60 ¼-inch flat washer (16)
61 Access cover (2)
62 Rubber gasket (2)
63 Dome
64 $\frac{5}{16}$-inch by 18 by 1¼-inch socket-head screw (6)
65 $\frac{5}{16}$-inch lockwasher (6)
66 $\frac{5}{16}$-inch flat washer (6)
67 $\frac{5}{16}$-inch by 18 by 1½-inch socket-head screw (6)
68 $\frac{5}{16}$-inch lockwasher (6)
69 $\frac{5}{16}$-inch flat washer (6)
70 Spacer adapter
71 O-ring gasket (special, ID 15.0 inches)
72 Laminated shim halfset
73 O-ring gasket (special, ID 4.734 inches)
74 External beveled retaining ring (ID 3.5 inches)
75 Baffle spacer
76 Laminated shim (ID 3.51 inches)
77 Ball bearing (ID 4.0 inches)
78 Bearing spacer
79 Internal beveled retaining ring (ID 4.734 inches)
80 Ball bearing (ID 3.5 inches)
81 Tube assembly
82 Encased seal (A)
83 Encased seal (B)
84 O-ring gasket (special, ID 3.234 inches)
85 O-ring gasket (special, ID 4.5 inches)
86 Upper bearing housing
87 Flange-type retaining ring (ID 3.562 inches)
88 ¼-inch flat washer (6)
89 ¼-inch lockwasher (6)
90 ¼-inch by 20 by 1-inch socket-head screw (6)
91 Housing end plate
92 No. 8 flat washer (8)
93 No. 8 lockwasher (8)
94 8 by 32 by ½-inch socket-head screw (8)
95 Spacer (6)
96 Flange-type retaining ring (ID 4.125 inches)
97 External retaining ring (ID 3.242 inches)
98 O ring gasket (special, ID 3.109 inches)
99 ¼-inch by 20 by 1-inch hexagonal-head screw (6)
100 ¼-inch lockwasher (6)
101 ¼-inch flat washer (6)
102 Lower waveguide transition
103 Lower dielectric sleeve
104 O-ring gasket (special, ID 4.109 inches)
105 Bearing and choke housing
106 No. 10 flat washer (6)
107 No. 10 lockwasher (6)
108 10 by 24 by 1½-inch socket-head screw (6)
109 Internal retaining ring (ID 1.608 inches)
110 External retaining ring (ID 1.971 inches)
111 Ball bearing (ID 2.065 inches)
112 External retaining ring (ID 1.971 inches)
113 External retaining ring (ID 1.971 inches)
114 Ball bearing (ID 2.065 inches)
115 Preformed O-ring (ID 1.484 inches) (2)
116 Collar bearing
117 Internal retaining ring (ID 2.613 inches)
118 O-ring gasket (special, ID 4.484 inches)
119 Flange-type retaining ring (ID 1.32 inches)
120 External retaining ring (ID 1.25 inches)
121 ¼-inch by 20 by ⅞-inch socket-head screw (4)
122 ¼-inch lockwasher (4)
123 ¼-inch flat washer (4)
124 Adapter
125 ¼-inch flat washer (6)
126 ¼-inch lockwasher (6)
127 ¼-inch by 20 by 1-inch socket-head screw (6)
128 Pipe-to-tube adapter
129 ¼-inch by 20 self-locking hexagonal nut (6)
130 ¼-inch flat washer (6)
131 External retaining ring (ID 2.832 inches)
132 Ball bearing (ID 3.06 inches)
133 Internal retaining ring (ID 3.921 inches)
134 Upper choke
135 Sleeve bearing
136 Sleeve
137 O-ring gasket (special, ID 4.484 inches)
138 Conductor housing
139 ¼-inch flat washer (6)
140 ¼-inch by 20 by 1¼-inch socket-head screw (6)
141 Lower IFF contact
142 No. 8 lockwasher
143 8 by 32 by ⅞-inch fiillister-head screw
144 ¼-inch by 20 self-locking hexagonal nut (6)
145 ¼-inch flat washer (6)
146 O-ring gasket (special, ID 3.484 inches)
147 Choke assembly
148 Special shim (ID 1.25 inches)
149 Choke body
150 ¼-inch flat washer (6)
151 ¼-inch by 20 by 1¼-inch socket-head screw (6)
152 Pipe plug
153 O-ring gasket (special, ID 0.984 inch)
154 Teflon sleeve
155 Reference line section contact
156 Spacer insulator
157 Connector adapter
158 No. 10 lockwasher (3)
159 10 by 24 by ⅝-inch fillister-head screw (3)
160 O-ring gasket (i.d. 0.5 inch)

Figure 9–9. Antenna Pedestal AB–651/FPS–69 rotary joint assembly, exploded view.


11
01
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3
158
159
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135
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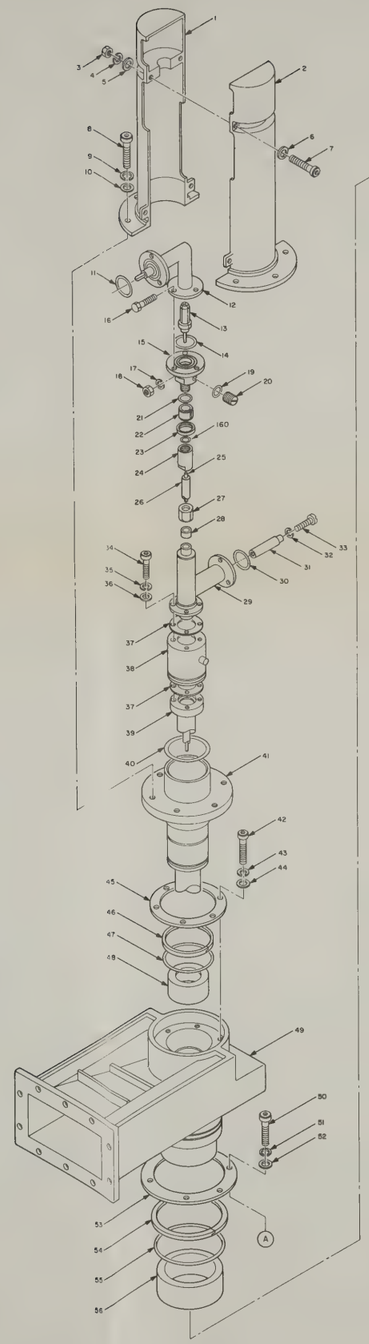
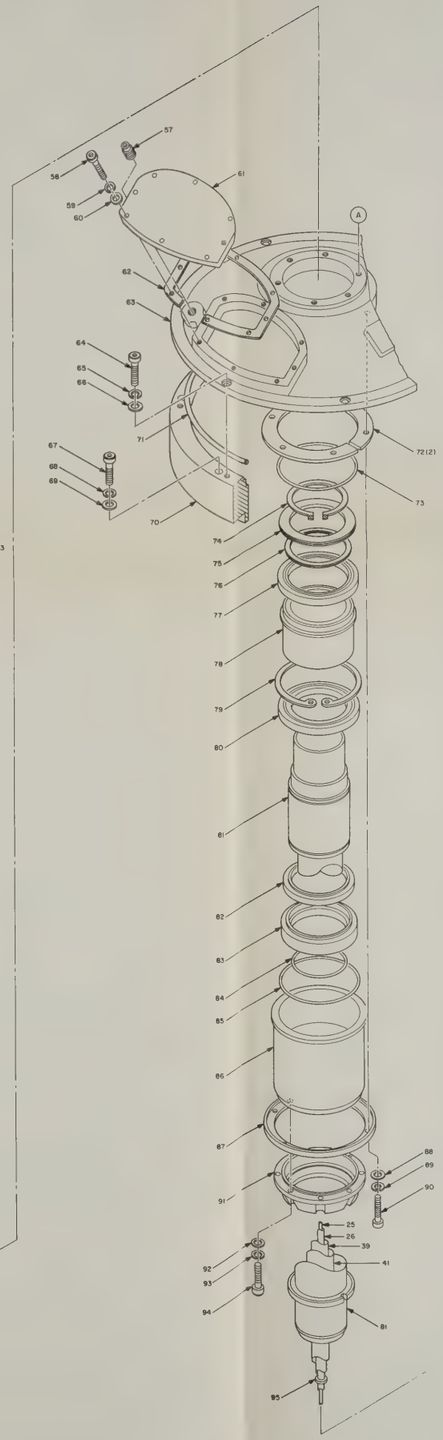
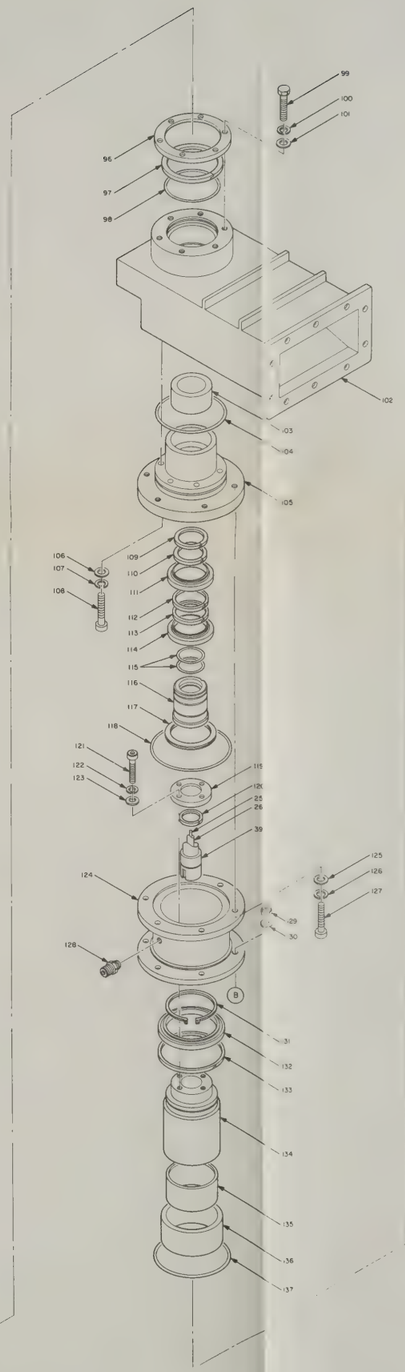
137

1 Line section guard (A)
2 Line section guard (B)
3 ¼-inch by 20 hexagonal nut (4)
4 ¼-inch lockwasher (4)
5 ¼-inch flat washer (4)
6 ¼-inch flat washer (4)
7 ¼-inch by 20 by ⅞-inch socket-head screw (4)
8 ¼-inch by 20 by ¾-inch socket-head screw (6)
9 ¼-inch lockwasher (6)
10 ¼-inch flat washer (6)
11 O-ring gasket
12 EIA-type angle adapter (CP1000)
13 Contact (J807)
14 O-ring gasket
15 Jack J807
16 ¼-inch by 20 by 1-inch hexagonal-head screw (3)
17 ¼-inch lockwasher (3)
18 ¼-inch by 20 hexagonal nut (3)
19 O-ring gasket
20 Plug
21 O-ring gasket (i.d. 0.375 inch)
22 Slotted sleeve
23 Internal tapered spacer
24 Locking nut
25 Reference rf transmission line section
26 IFF rf transmission line section
27 Packing nut
28 Round rubber section seal
29 IFF rf transmission line adapter
30 O-ring gasket
31 Upper IFF contact
32 No. 8 lockwasher
33 8 by 32 by ⅝-inch fillister-head screw
34 8 by 32 by ¾-inch socket-head screw (4)
35 No. 8 lockwasher (4)
36 No. 8 flat washer(4)
37 Rubber gasket (OD 2.0 inches) (2)
38 End sleeve
39 IFF rf transmission line section, outer conductor
40 O-ring gasket (special, ID 2.234 inches)
41 Main rf transmission line section
42 10 by 24 by ⅞-inch socket-head screw (6)
43 No. 10 lockwasher (6)
44 No. 10 flat washer (6)
45 Flange-type retaining ring (ID 3.625 inches)
46 External retaining ring (ID 2.817 inches)
47 O-ring gasket (special, ID 2.608 inches)
48 Upper dielectric sleeve
49 Upper waveguide transition
50 ¼-inch by 20 by 1-inch socket-head screw (6)
51 ¼-inch lockwasher (6)
52 ¼-inch flat washer (6)
53 Flange-type retaining ring (ID 5.125 inches)
54 External retaining ring (ID 4.208 inches)
55 O-ring gasket (special, ID 4.109 inches)
56 Dielectric sleeve
57 Pipe plug (2)
58 ¼-inch by 20 by ⅞-inch socket-head screw (16)
59 ¼-inch lockwasher (16)
60 ¼-inch flat washer (16)
61 Access cover (2)
62 Rubber gasket (2)
63 Dome
64 $\frac{5}{16}$-inch by 18 by 1¼-inch socket-head screw (6)
65 $\frac{5}{16}$-inch lockwasher (6)
66 $\frac{5}{16}$-inch flat washer (6)
67 $\frac{5}{16}$-inch by 18 by 1½-inch socket-head screw (6)
68 $\frac{5}{16}$-inch lockwasher (6)
69 $\frac{5}{16}$-inch flat washer (6)
70 Spacer adapter
71 O-ring gasket (special, ID 15.0 inches)
72 Laminated shim halfset
73 O-ring gasket (special, ID 4.734 inches)
74 External beveled retaining ring (ID 3.5 inches)
75 Baffle spacer
76 Laminated shim (ID 3.51 inches)
77 Ball bearing (ID 4.0 inches)
78 Bearing spacer
79 Internal beveled retaining ring (ID 4.734 inches)
80 Ball bearing (ID 3.5 inches)
81 Tube assembly
82 Encased seal (A)
83 Encased seal (B)
84 O-ring gasket (special, ID 3.234 inches)
85 O-ring gasket (special, ID 4.5 inches)
86 Upper bearing housing
87 Flange-type retaining ring (ID 3.562 inches)
88 ¼-inch flat washer (6)
89 ¼-inch lockwasher (6)
90 ¼-inch by 20 by 1-inch socket-head screw (6)
91 Housing end plate
92 No. 8 flat washer (8)
93 No. 8 lockwasher (8)
94 8 by 32 by ½-inch socket-head screw (8)
95 Spacer (6)
96 Flange-type retaining ring (ID 4.125 inches)
97 External retaining ring (ID 3.242 inches)
98 O ring gasket (special, ID 3.109 inches)
99 ¼-inch by 20 by 1-inch hexagonal-head screw (6)
100 ¼-inch lockwasher (6)
101 ¼-inch flat washer (6)
102 Lower waveguide transition
103 Lower dielectric sleeve
104 O-ring gasket (special, ID 4.109 inches)
105 Bearing and choke housing
106 No. 10 flat washer (6)
107 No. 10 lockwasher (6)
108 10 by 24 by 1½-inch socket-head screw (6)
109 Internal retaining ring (ID 1.608 inches)
110 External retaining ring (ID 1.971 inches)
111 Ball bearing (ID 2.065 inches)
112 External retaining ring (ID 1.971 inches)
113 External retaining ring (ID 1.971 inches)
114 Ball bearing (ID 2.065 inches)
115 Preformed O-ring (ID 1.484 inches) (2)
116 Collar bearing
117 Internal retaining ring (ID 2.613 inches)
118 O-ring gasket (special, ID 4.484 inches)
119 Flange-type retaining ring (ID 1.32 inches)
120 External retaining ring (ID 1.25 inches)
121 ¼-inch by 20 by ⅞-inch socket-head screw (4)
122 ¼-inch lockwasher (4)
123 ¼-inch flat washer (4)
124 Adapter
125 ¼-inch flat washer (6)
126 ¼-inch lockwasher (6)
127 ¼-inch by 20 by 1-inch socket-head screw (6)
128 Pipe-to-tube adapter
129 ¼-inch by 20 self-locking hexagonal nut (6)
130 ¼-inch flat washer (6)
131 External retaining ring (ID 2.832 inches)
132 Ball bearing (ID 3.06 inches)
133 Internal retaining ring (ID 3.921 inches)
134 Upper choke
135 Sleeve bearing
136 Sleeve
137 O-ring gasket (special, ID 4.484 inches)
138 Conductor housing
139 ¼-inch flat washer (6)
140 ¼-inch by 20 by 1¼-inch socket-head screw (6)
141 Lower IFF contact
142 No. 8 lockwasher
143 8 by 32 by ⅞-inch fiillister-head screw
144 ¼-inch by 20 self-locking hexagonal nut (6)
145 ¼-inch flat washer (6)
146 O-ring gasket (special, ID 3.484 inches)
147 Choke assembly
148 Special shim (ID 1.25 inches)
149 Choke body
150 ¼-inch flat washer (6)
151 ¼-inch by 20 by 1¼-inch socket-head screw (6)
152 Pipe plug
153 O-ring gasket (special, ID 0.984 inch)
154 Teflon sleeve
155 Reference line section contact
156 Spacer insulator
157 Connector adapter
158 No. 10 lockwasher (3)
159 10 by 24 by ⅝-inch fillister-head screw (3)
160 O-ring gasket (i.d. 0.5 inch)

Figure 9–9. Antenna Pedestal AB–651/FPS–69 rotary joint assembly, exploded view.







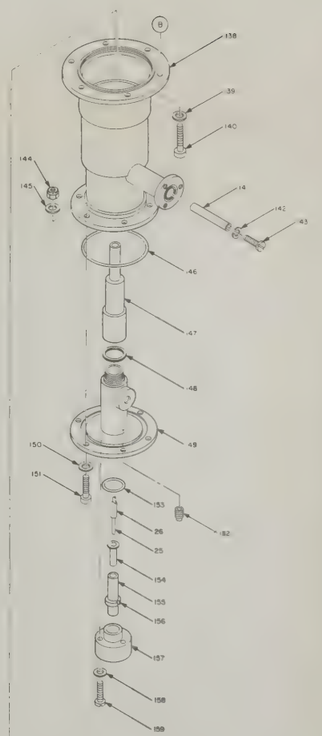


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Figure 9-9.—Continued

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6

crew (4)

screw (6)

ad screw (3)

n

(4)

screw (12)

ead screw (6)

elf-locking screw (6)

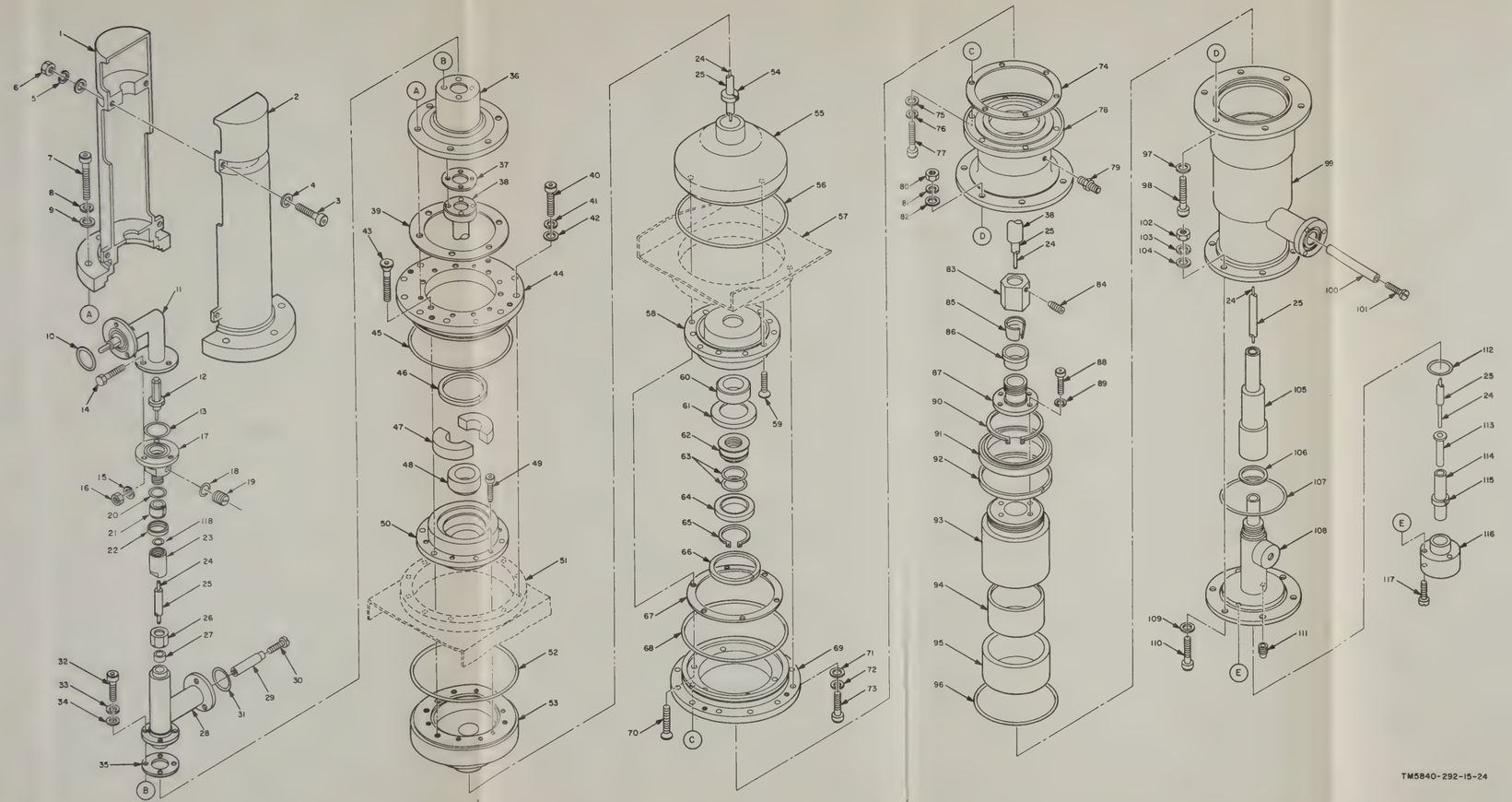
) 0.062 inch)

) 0.062 inch)

elf-locking screw (6)

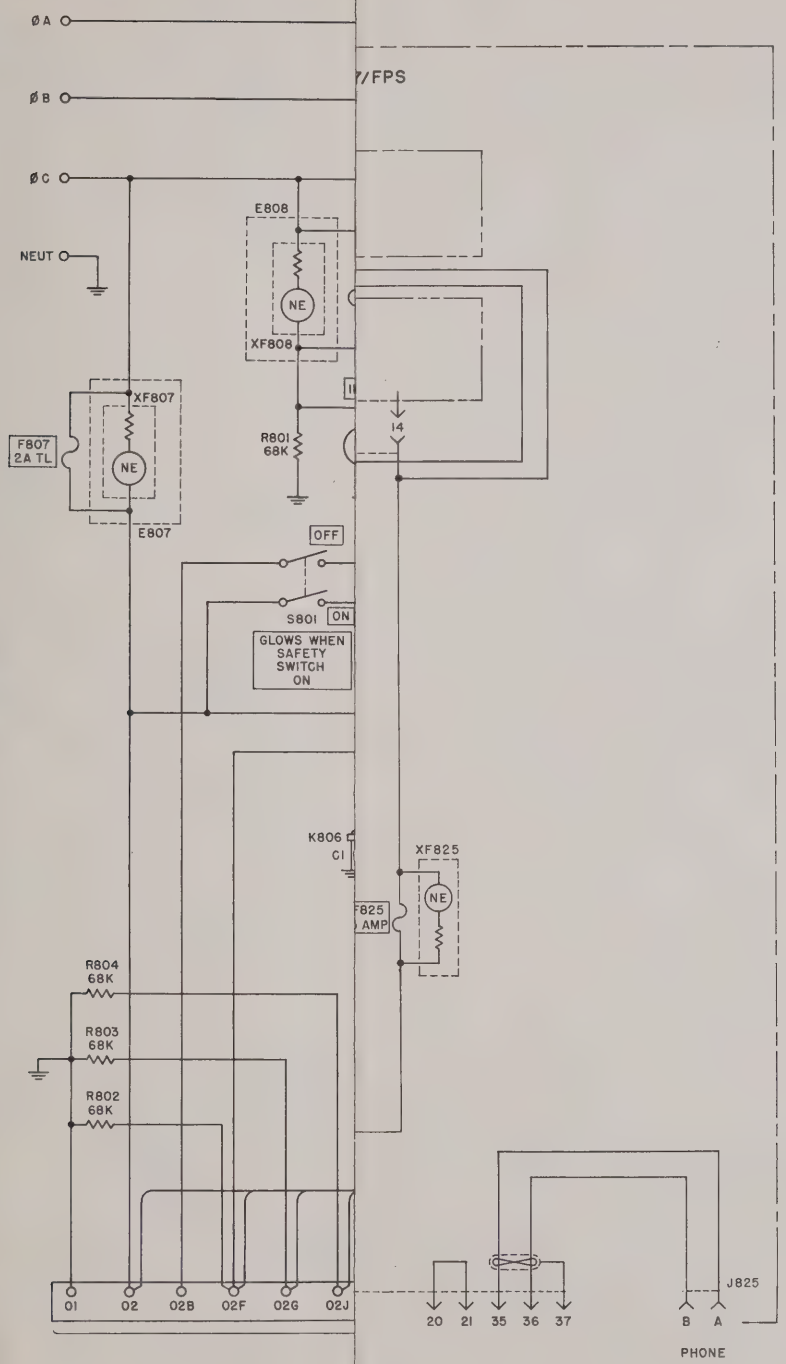
60 Polyiron spacer
61 Positioning spacer
62 Collar bearing
63 Preformed O-ring (special) (2)
64 Ball bearing (small)
65 External retaining ring (beveled)
66 Retaining ring
67 Spacer ring
68 O-ring gasket (special)
69 Lower flange housing
70 ¼-inch by 20 by 1¾-inch socket flathead screw (6)
71 ¼-inch flat washer (12)
72 ¼-inch lockwasher (12)
73 ¼-inch by 20 by 1-inch socket-head screw (12)
74 Rubber gasket (OD 5.38 inches)
75 ¼-inch flat washer (6)
76 ¼-inch lockwasher (6)
77 ¼-inch by 20 by ⅞-inch socket-head screw (6)
78 Adapter
79 Pipe-to-tube adapter
80 ¼-inch by 20 hexagonal nut (6)
81 ¼-inch lockwasher (6)
82 ¼-inch flat washer (6)
83 Locking nut
84 8 by 32 by ¼-inch socket-head setscrew (3)
85 Serrated lockring
86 Locking ring
87 Main transmission line retainer flange
88 10 by 24 by ⅝-inch socket-head screw (4)
89 No. 10 lockwasher (4)
90 External retaining ring
91 Ball bearing (large)
92 Retaining ring
93 Upper choke
94 Sleeve bearing
95 Sleeve
96 O-ring gasket
97 ¼-inch flat washer (6)
98 ¼-inch by 20 by 1½-inch socket-head screw (6)
99 Conductor housing
100 Lower IFF contact
101 8 by 32 by ⅞-inch fillister-head screw
102 ¼-inch by 20 hexagonal nut (6)
103 ¼-inch lockwasher (6)
104 ¼-inch flat washer (6)
105 Choke assembly
106 Special shim (2)
107 O-ring gasket
108 Choke body
109 ¼-inch flat washer (6)
110 ¼-inch by 20 by 1½-inch socket-head screw (6)
111 Pipe plug
112 O-ring gasket
113 Teflon sleeve
114 Reference line section contact
115 Spacer insulator
116 Connector adapter
117 10 by 24 by ⅝-inch fillister-head screw (3)
118 O-ring gasket (i.d. 0.5 inch)

a Pedestal AB–876/FPS–71 rotary joint assembly, exploded view.

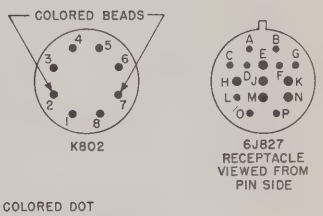


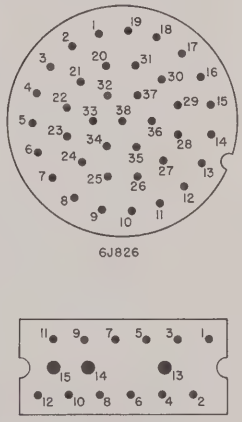
1 Line section guard (A)
2 Line section guard (B)
3 ¼-inch by 20 by ⅝-inch socket-head screw (4)
4 ¼-inch flat washer (8)
5 ¼-inch lockwasher (4)
6 ¼-inch by 20 hexagonal nut (4)
7 ¼-inch by 20 by 1½-inch socket-head screw (6)
8 ¼-inch lockwasher (6)
9 ¼-inch flat washer (6)
10 O-ring gasket
11 EIA-type angle adapter (CP1000)
12 Contact (J807)
13 O-ring gasket
14 ¼-inch by 20 by 1-inch hexagonal-head screw (3)
15 ¼-inch lockwasher (3)
16 ¼-inch by 20 hexagonal nut (3)
17 Jack J807
18 O-ring gasket
19 Plug
20 O-ring gasket (i.d. 0.375 inch)
21 Slotted sleeve
22 Internal tapered spacer
23 Locking nut
24 Reference rf transmission line section
25 IFF rf transmission line section
26 Packing nut
27 Round rubber section seal
28 IFF rf transmission line adapter
29 Upper IFF contact
30 8 by 32 by ¼-inch fillister-head screw
31 O-ring gasket
32 8 by 32 by ¼-inch socket-head screw (4)
33 No. 8 lockwasher (4)
34 No. 8 flat washer (4)
35 Rubber gasket (OD 2.0 inches)
36 Drive housing
37 Rubber gasket (OD 1.93 inches)
38 Main rf transmission line section
39 Rubber gasket (OD 5.74 inches)
40 ¼-inch by 20 by 1-inch socket-head screw (12)
41 ¼-inch lockwasher (12)
42 ¼-inch flat washer (12)
43 ¼-inch by 20 by 1¼-inch socket flathead screw (6)
44 Upper flange housing
45 O-ring gasket (special)
46 Retaining ring
47 Sleeve bearing, halfset
48 Polyiron spacer
49 8 by 32 by ¼-inch socket, flathead, self-locking screw (6)
50 Upper bearing housing
51 Dome assembly
52 Indium solder electrical gasket (OD 0.062 inch)
53 Upper main transition
54 Spacer (6)
55 Lower main transition
56 Indium solder electrical gasket (OD 0.062 inch)
57 Waveguide transition
58 Lower bearing housing
59 8 by 32 by ⅜-inch socket, flathead, self-locking screw (6)
60 Polyiron spacer
61 Positioning spacer
62 Collar bearing
63 Preformed O-ring (special) (2)
64 Ball bearing (small)
65 External retaining ring (beveled)
66 Retaining ring
67 Spacer ring
68 O-ring gasket (special)
69 Lower flange housing
70 ¼-inch by 20 by 1½-inch socket flathead screw (6)
71 ¼-inch flat washer (12)
72 ¼-inch lockwasher (12)
73 ¼-inch by 20 by 1-inch socket-head screw (12)
74 Rubber gasket (OD 5.38 inches)
75 ¼-inch flat washer (6)
76 ¼-inch lockwasher (6)
77 ¼-inch by 20 by ¾-inch socket-head screw (6)
78 Adapter
79 Pipe-to-tube adapter
80 ¼-inch by 20 hexagonal nut (6)
81 ¼-inch lockwasher (6)
82 ¼-inch flat washer (6)
83 Locking nut
84 8 by 32 by ¼-inch socket-head setscrew (3)
85 Serrated lockring
86 Locking ring
87 Main transmission line retainer flange
88 10 by 24 by ¾-inch socket-head screw (4)
89 No. 10 lockwasher (4)
90 External retaining ring
91 Ball bearing (large)
92 Retaining ring
93 Upper choke
94 Sleeve bearing
95 Sleeve
96 O-ring gasket
97 ¼-inch flat washer (6)
98 ¼-inch by 20 by 1½-inch socket-head screw (6)
99 Conductor housing
100 Lower IFF contact
101 8 by 32 by ¾-inch fillister-head screw
102 ¼-inch by 20 hexagonal nut (6)
103 ¼-inch lockwasher (6)
104 ¼-inch flat washer (6)
105 Choke assembly
106 Special shim (2)
107 O-ring gasket
108 Choke body
109 ¼-inch flat washer (6)
110 ¼-inch by 20 by 1½-inch socket-head screw (6)
111 Pipe plug
112 O-ring gasket
113 Teflon sleeve
114 Reference line section contact
115 Spacer insulator
116 Connector adapter
117 10 by 24 by ¾-inch fillister-head screw (3)
118 O-ring gasket (i.d. 0.5 inch)

Figure 9-10, Antenna Pedestal AB-876/FPS-71 rotary joint assembly, exploded view.

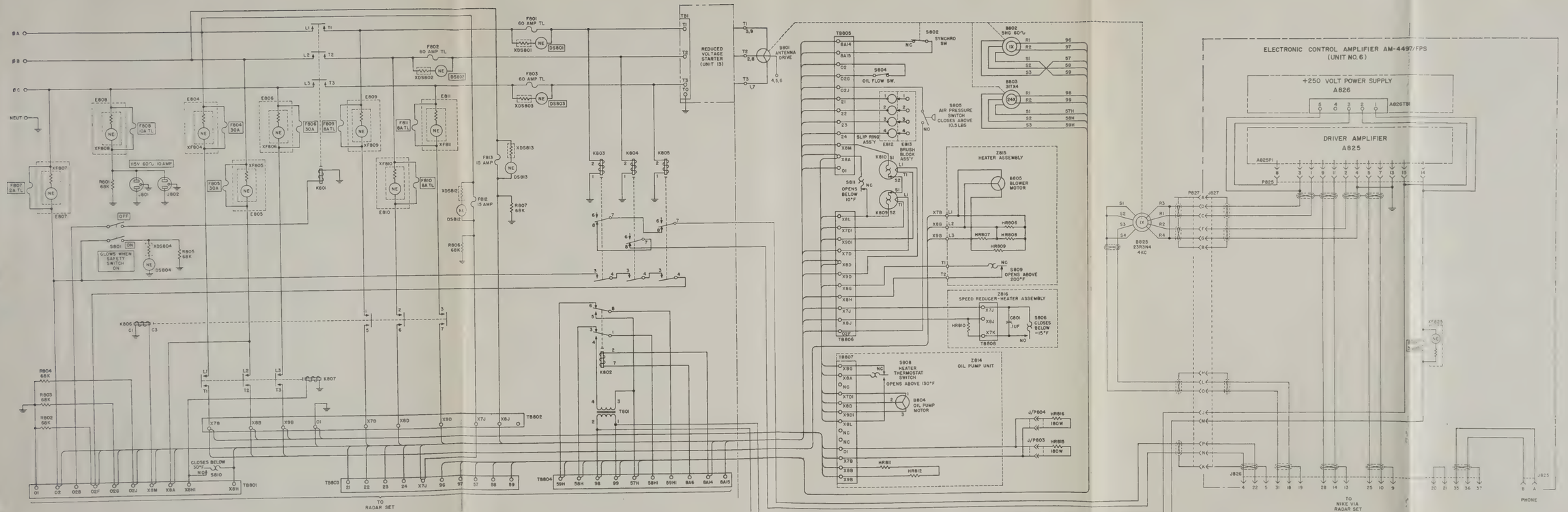


NOTES:

1. UNLESS OTHERWISE INDICATED: RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. ▭ INDICATES EQUIPMENT MARKING
3. OPERATING TEMPERATURES ARE ±5°
4. THE CIRCUITRY OF THE REDUCED VOLTAGE STARTER, UNIT NO. 13 IS SHOWN ON ILLUSTRATION ENTITLED: REDUCED VOLTAGE STARTER, UNIT NO. 13, COMPLETE SCHEMATIC DIAGRAM.
5. THE CIRCUITRY OF SUBASSEMBLIES 6A825 AND 6A826 IS SHOWN ON THE FOLLOWING ILLUSTRATIONS:
   A. DRIVER AMPLIFIER 6A825, COMPLETE SCHEMATIC DIAGRAM.
   B. POWER SUPPLY 6A826, COMPLETE SCHEMATIC DIAGRAM.
6. 

7. RECEPTACLES VIEWED FROM PIN SIDE.


TM5840-292-15-36



NOTES:
1. UNLESS OTHERWISE INDICATED: RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF
2. ▭ INDICATES EQUIPMENT MARKING
3. OPERATING TEMPERATURES ARE ±5°
4. THE CIRCUITRY OF THE REDUCED VOLTAGE STARTER, UNIT NO. 13 IS SHOWN ON ILLUSTRATION ENTITLED REDUCED VOLTAGE STARTER, UNIT NO. 13, COMPLETE SCHEMATIC DIAGRAM.
5. THE CIRCUITRY OF SUBASSEMBLIES 6A825 AND 6A826 IS SHOWN ON THE FOLLOWING ILLUSTRATIONS:
   A. DRIVER AMPLIFIER 6A825, COMPLETE SCHEMATIC DIAGRAM.
   B. POWER SUPPLY 6A826, COMPLETE SCHEMATIC DIAGRAM
6. COLORED BEADS
   K802
   6J827 RECEPTACLE VIEWED FROM PIN SIDE
   COLORED DOT
   K803, K804, K805
7. RECEPTACLES VIEWED FROM PIN SIDE
   6-826
   6A825P1

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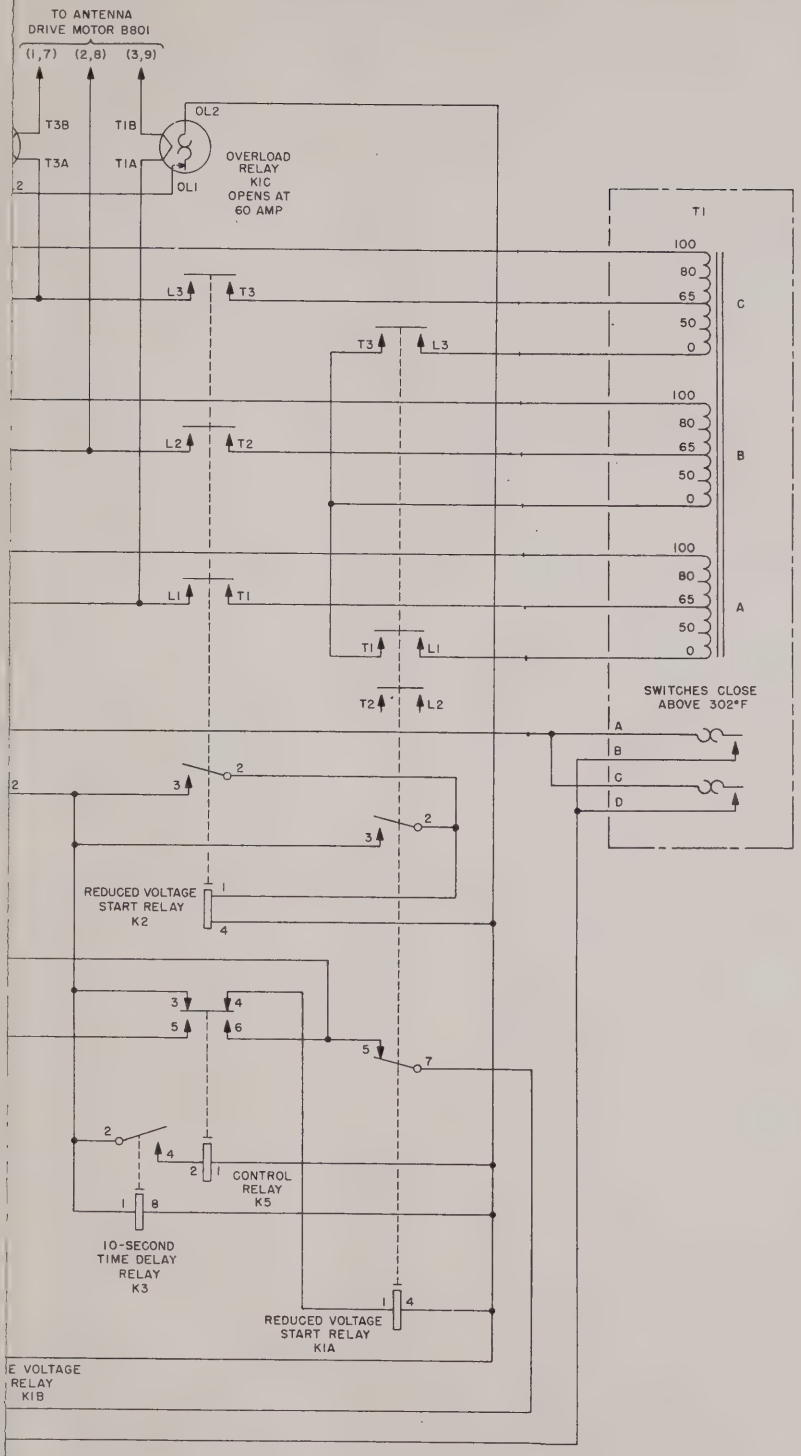
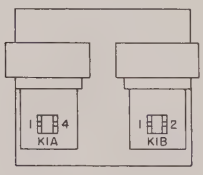
Figure 9-11. Antenna pedestal, complete schematic diagram.

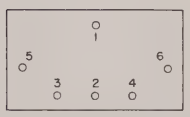


NOTES

1. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 13.
2. RELAY BASE DETAILS



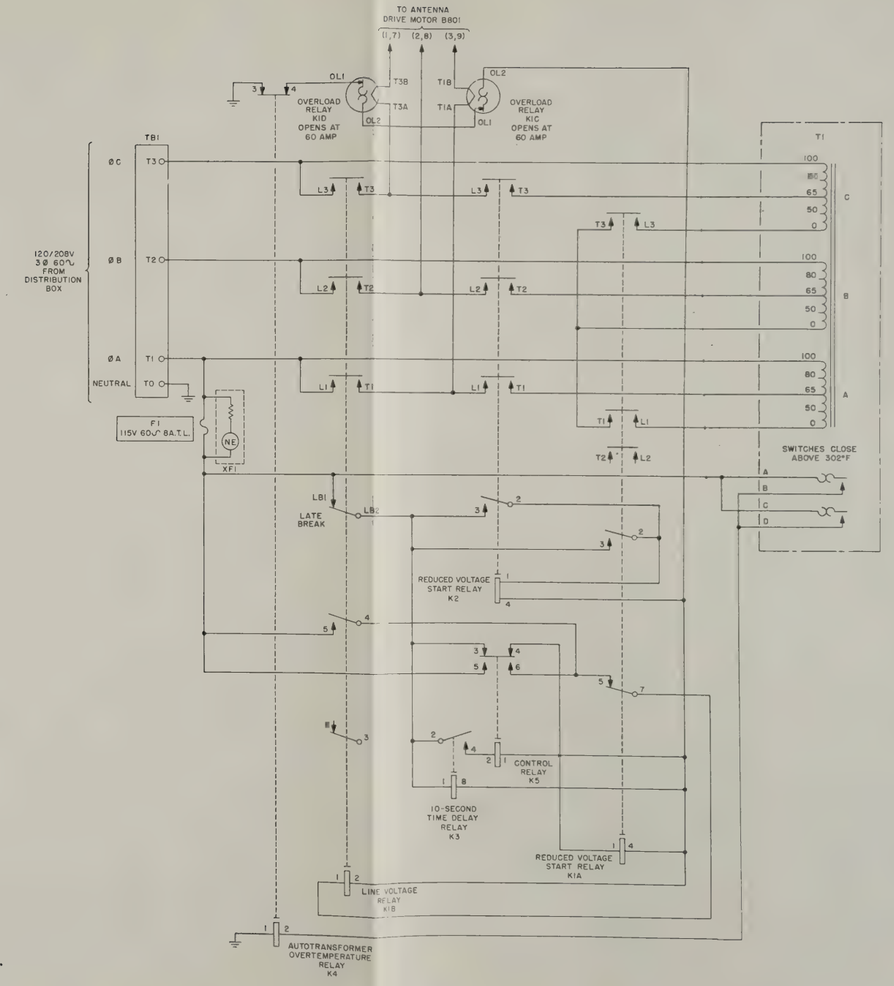
K1



K4 AND K5

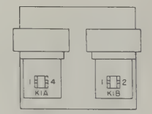
TM5840-201-35-C6-5

re 9–12. Reduced voltage starter, unit No. 13, complete schematic diagram.



NOTES

1. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 13.
2. RELAY BASE DETAILS

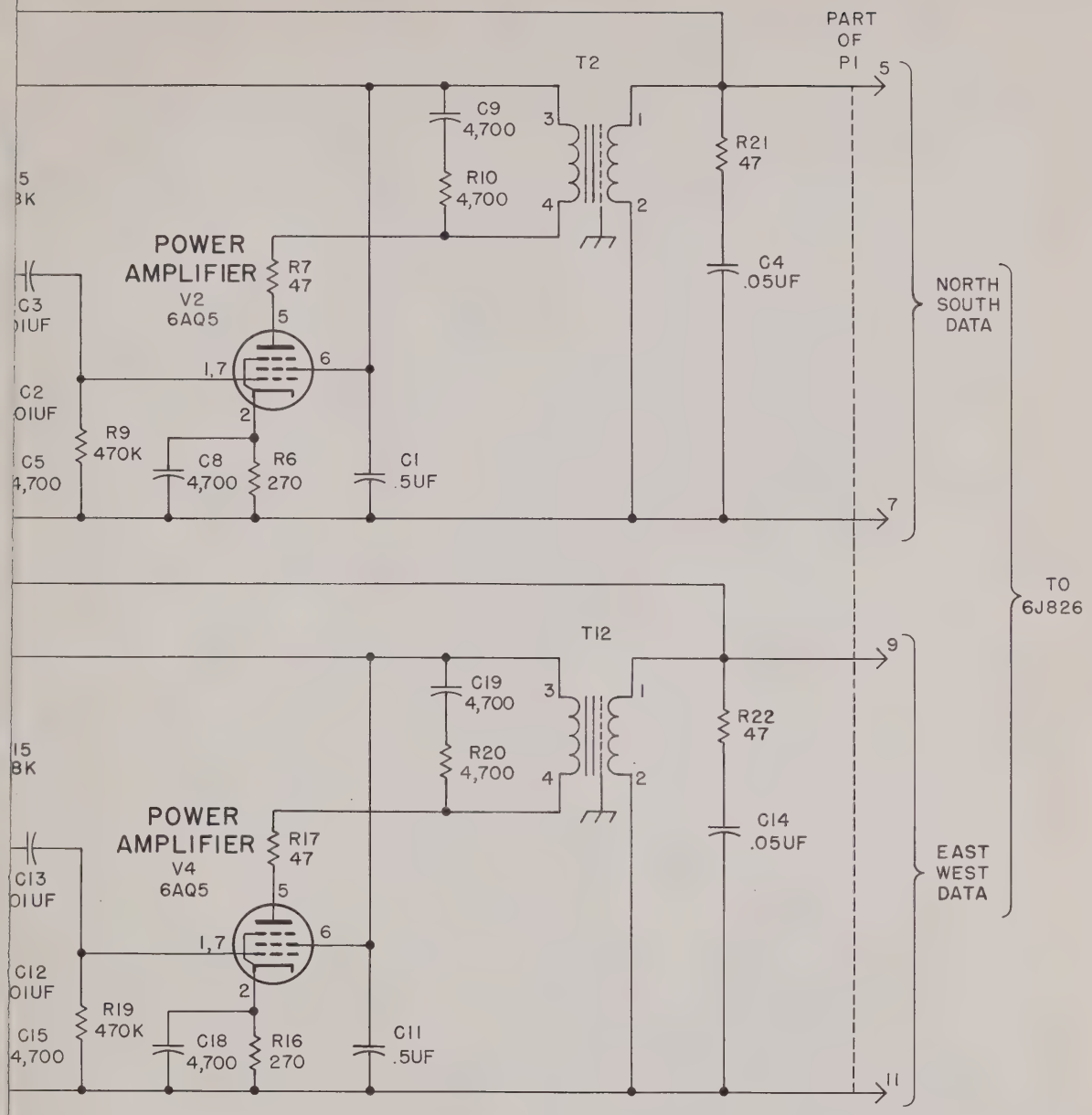


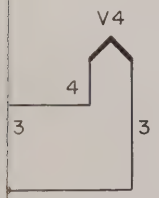
K1

K4 AND K5

TM5840-201-35-C6-5

Figure 9-12. Reduced voltage starter, unit No. 13, complete schematic diagram.



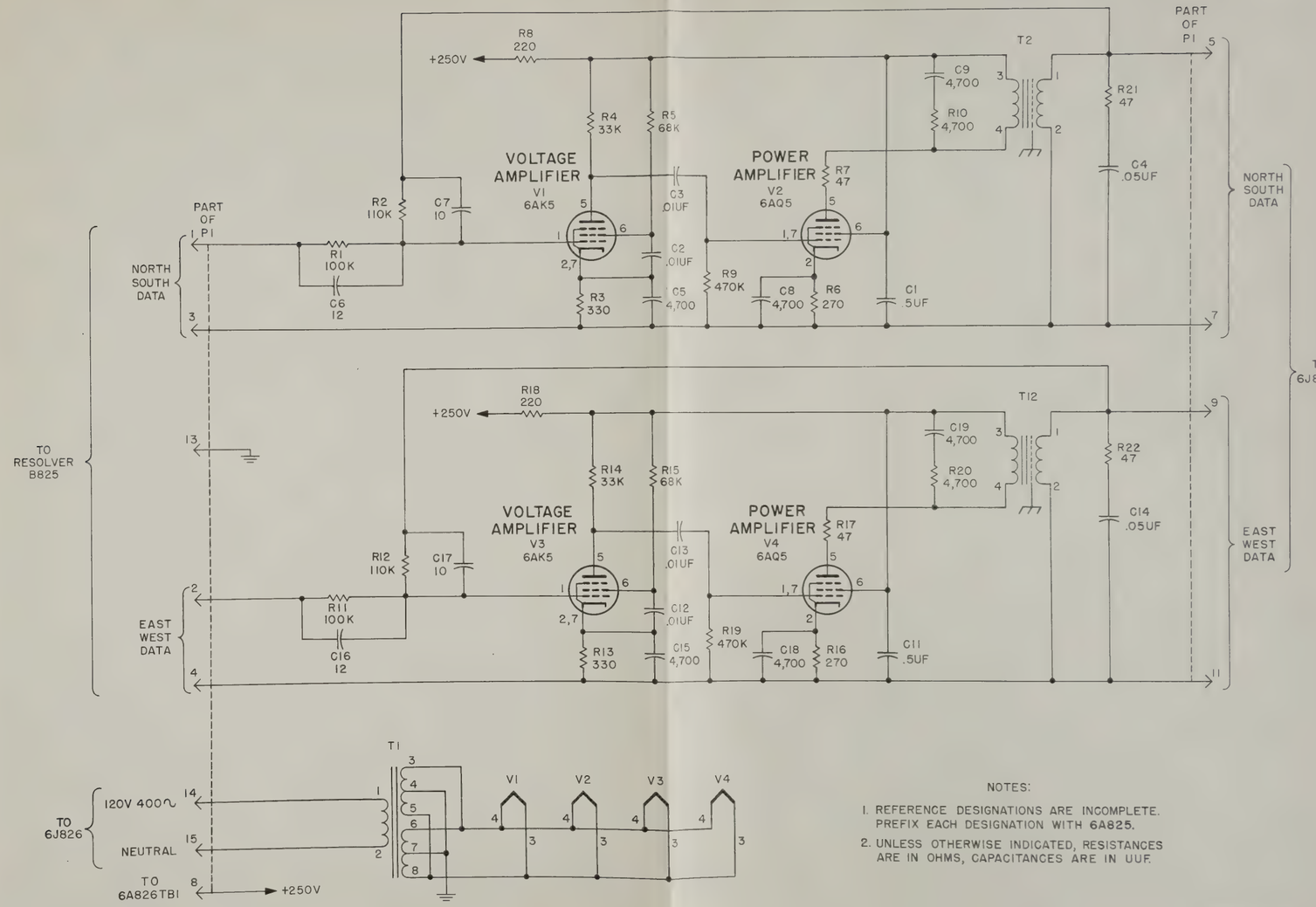


NOTES:

1. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A825.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.

TM5840-252-35-295

825, complete schematic diagram.



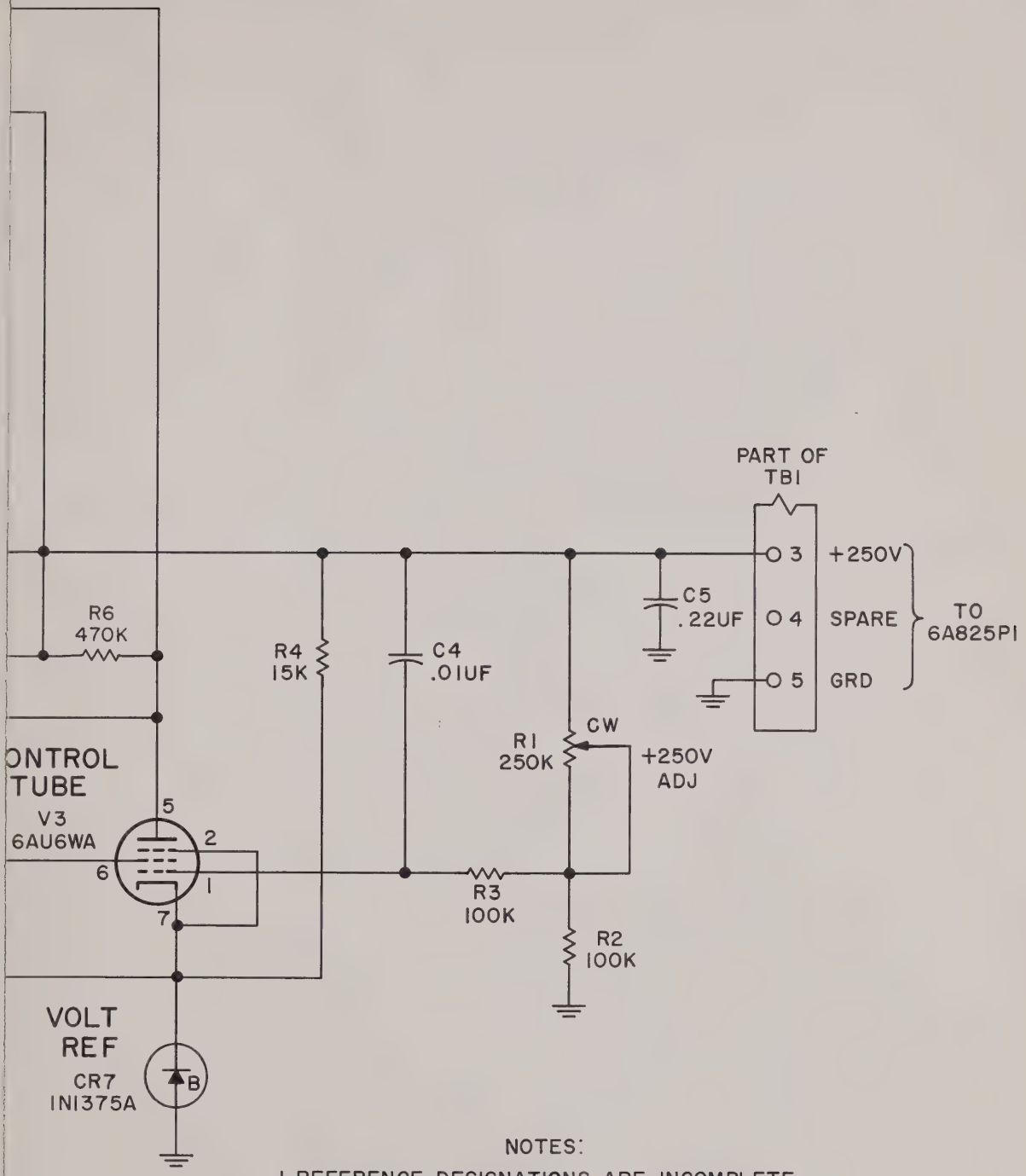
NOTES:

1. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A825.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.

Figure 9-13. Driver amplifier 6A825, complete schematic diagram.

TAGO 6591-A

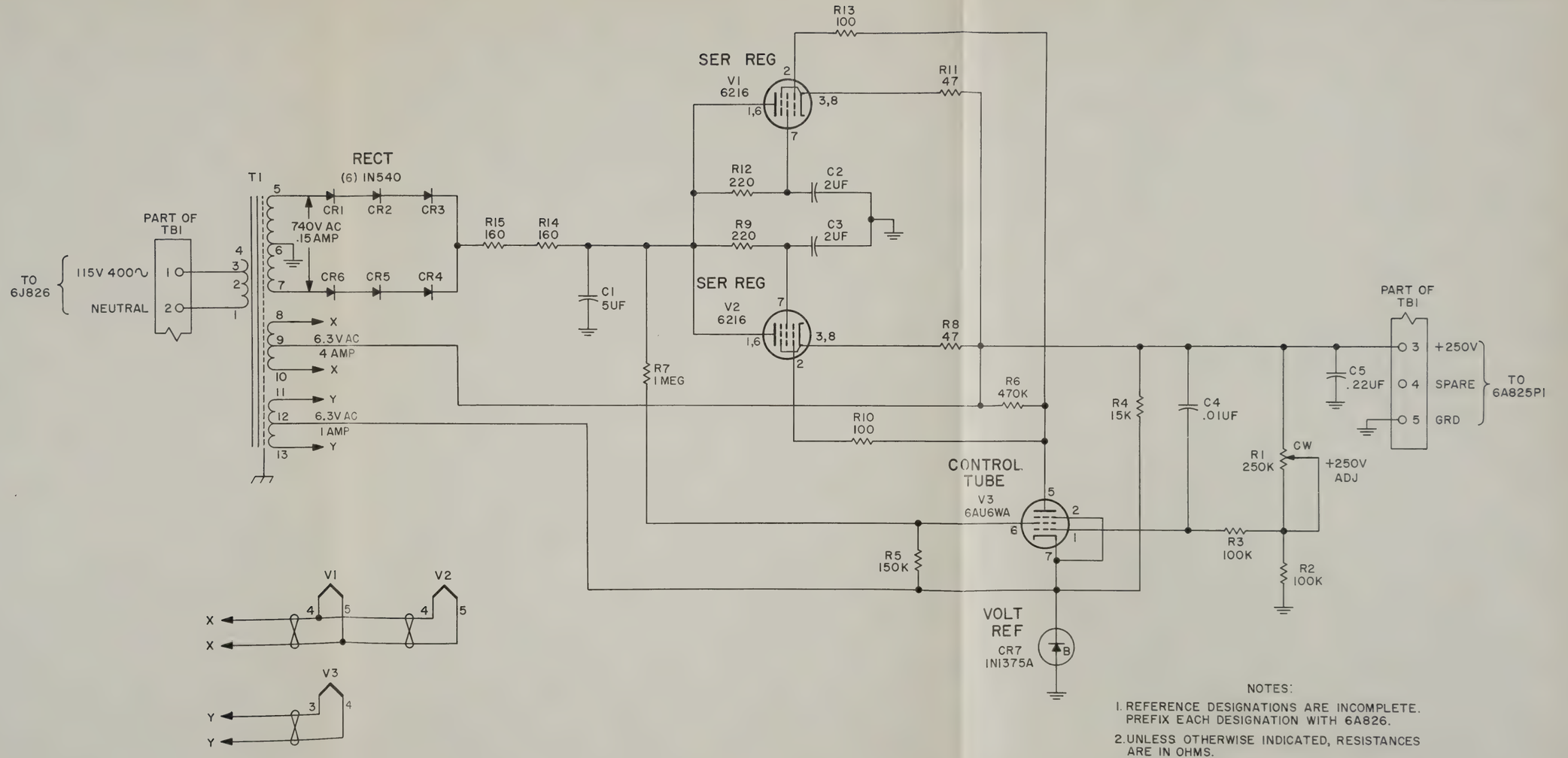
TM5840-252-35-295



NOTES:

1. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A826.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS.
3. DIODES ARE SHOWN WITH BAR REPRESENTING THE CATHODE.

TM5840-292-15-35



NOTES:

1. REFERENCE DESIGNATIONS ARE INCOMPLETE. PREFIX EACH DESIGNATION WITH 6A826.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS.
3. DIODES ARE SHOWN WITH BAR REPRESENTING THE CATHODE.

TM5840-292-15-35

Figure 9-14. Power supply 6A826, complete schematic diagram.

TAGO 6591-A

APPENDIX I

REFERENCES

Following is a list of applicable references available to the operator and repairman of Antenna Groups OA–4040/FPS–69 and OA–6957/FPS–71.

DA Pamphlet 310–4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
MWO 11–5840–243–30/1	Modification of Antenna Pedestal AB–465/FPS, Part of Antenna Group OA–1124/FPS, to Make the Grease Fitting on the Speed Reducer More Accessible and to Prevent Chatter of Relay K801.
TB SIG 364	Field Instructions for Painting and Preserving Electronics Command Equipment.
(CM) TM 9–1430–250–20/1	Organizational Maintenance: Theory: Acquisition Radar System, Radar Course Directing Central (NIKE-HERCULES Air Defense Guided Missile System) (U).
TM 11–673	Generation and Transmission of Microwave Energy.
TM 11–4000	Troubleshooting and Repair of Radio Equipment.
TM 11–5527	Multimeters TS–352/U, TS–352A/U, and TS–352B/U.
TM 11–5840–252–12–1	Organizational Maintenance Manual: Radar Set AN/FPS–71 (Improved).
(C) TM 11–5840–252–35–1-Series	DS, GS, and Depot Maintenance Manual: Radar Set AN/FPS–71 (Improved) (U).
TM 11–5840–296–12	Organizational Maintenance Manual: Radar Set AN/FPS–69 (Improved).
TM 11–5840–296–35	DS, GS, and Depot Maintenance Manual: AN/FPS–69 (Improved).
(O) TM 11–5895–207–10	Operator's Manual: Interrogator Set AN/TPX–26 and Radar Set Control Group AN/FPA–14.
(O) TM 11–5895–207–20	Organizational Maintenance Manual: Interrogator Set AN/TPX–26 and Radar Set Control Group AN/FPA–14.
TM 11–6625–200–12	Operator and Organizational Maintenance Manual: Multimeters ME–26A/U, ME–26B/U, and ME–26C/U.
TM 11–6625–203–12	Operator and Organizational Maintenance: Multimeter AN/URM–105, Including Multimeter ME–77/U.
TM 11–6625–219–12	Organizational Maintenance Manual: Oscilloscope AN/USM–81.
TM 11–6625–274–12	Operator's and Organizational Maintenance Manual Test Sets, Electron Tube TV–7/U, TV–7A/U, TV–7B/U, and TV–7D/U.
TM 38–750	Army Equipment Record Procedures.

APPENDIX II

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

A2–1. General

This appendix lists items supplied for initial operation and for running spares. The list includes tools, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

A2–2. Columns

Columns are as follows:

a. Federal Stock Number. This column lists the 11-digit Federal stock number.

b. Designation by model. The dagger (†) indicates model in which the part is used.

c. Description. Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

d. Unit of Issue. The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

e. Expendability. Nonexpendable items are indicated by NX. Expendable items are not annotated.

f. Quantity authorized. Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spare Items" the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.

g. Illustration. The numbers in the "Figure No." column refer to the illustrations where the part is shown.

Section II. BASIC ISSUE ITEMS LIST

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
											FIGURE NO.	ITEM NO.
5840-082-3877							ANTENNA GROUP OA-6957/FPS-71		NX		1-1	
5840-889-3909							ANTENNA GROUP OA-4040/FPS-69		NX		1-1	
							NOTE: Model Column 1 refers to OA-6957/FPS-71; Column 2 refers to OA-4040/FPS-69					
							ITEMS COMPRISING AN OPERABLE EQUIPMENT					
ORD thru AGC	/	/					TECHNICAL MANUAL TM 11-5840-292-15			1		
							NOTE: For technical manuals the quantity indicates the maximum number of copies authorized for packing (or issue) with the equipment. Where a number of these equipments are concentrated in a small area, the quantity on hand may be reduced to practical levels. Excess publications must be returned to publication supply centers through AG channels.					
5840-536-3295	/						ANTENNA AS-847/FPS		NX	1	1-1	
5840-082-4093		/					ANTENNA AS-1748/FPS		NX	1	1-1	
5840-086-8093	/	/					ANTENNA AS-1308/FPS		NX	1	1-1	
	/	/					AMPLIFIER, ELECTRONIC CONTROL AM-4497/FPS (P/o Pedestal, Antenna AB-876/FPS-71) (M5RC13-47)		NX	1	1-1	
5995-519-0774	/	/					CABLE ASSEMBLY R. F. CG-1514/U 11 ft 0 in		NX	1	6-3	
5995-519-0414	/	/					CABLE ASSEMBLY, POWER ELECTRICAL CX-3909/U 52 ft 0 in		NX	2	1-2	
5995-889-0981	/	/					CABLE ASSEMBLY, RADIO FREQUENCY CG-2508/U 17 ft 10 in		NX	1	2-8	
5840-889-3907		/					PEDESTAL, ANTENNA AB-651/FPS-69		NX	1	1-1	
5840-082-3878	/						PEDESTAL, ANTENNA AB-876/FPS-71		NX	1	1-1	
5840-901-1145	/	/					REDUCED VOLTAGE STARTER: Model No. AP-133; Raytheon P/n 316710 (P/o Pedestal Antenna AB-876/FPS-71, AB-651/FPS-69)		NX	1	1-1	
5840-561-6274	/	/					WAVEGUIDE ASSEMBLY CG-1435/FPS-19: H Bend-90°			2	1-2	

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		OA-6957/FPS-71 (continued)					
5840-538-0926	/ /	WAVEGUIDE ASSEMBLY CG-1436/FPS-19 E-Bend 90°			2	1-2	
5840-536-3292	/ /	WAVEGUIDE ASSEMBLY CG-1512/U (3 ft 0 in)			1	1-2	
5840-536-3293	/ /	WAVEGUIDE ASSEMBLY CG-1513/U: (10 ft 0 in)			2	1-2	
		RUNNING SPARE ITEMS					
8120-086-8131	/ /	ADAPTER: U/W Pressurizing Kit HD-51/GT F/compressed gas cylinder valve connection; Bastain Blessing Co P/N 999-32 (Nitrogen Gas)			1		
8040-531-7834	/ /	ADHESIVE: Neoprene; liquid form; BB Chemical Formula No. 1021P3		QT	1		
5840-574-6602	/ /	CARTRIDGE: cardboard w/polyethylene nozzle; Cleveland Container Corp P/N 1001 w/end cap			2		
5120-542-4228	/ /	CAULKING, GUN: spring section; Raytheon P/N 2631-1271P			1		
5840-574-6614	/ /	FUNNEL: W/o strainer; w/Flexible metal hose; Raytheon P/N 263-1272P1			1		
5840-564-5327	/ /	HOSE, RUBBER: 2 ft 0 in lg; Greene Rubber P/N 2700-5001			1		
5970-543-1154	/ /	INSULATION TAPE, ELECTRICAL: Minnesota Mining type No. 27, Mil Style #GFT	Roll		1		
5840-561-6333	/ /	MEASURING ROD: DS Kennedy P/N 410-135G1 per Raytheon part/dwg S2630-1016G1			1		
4940-407-6295	/ /	PRESSURIZING KIT HD-51/GT			1		
5840-691-3157	/ /	SEAL, WAVEGUIDE: Raytheon P/N 4589-5002G1			2		
8030-574-0200	/ /	SEALING COMPOUND: syn rubber; Presstite-Keystone Eng Prods Co. (Formula 106A plus accelerator)		QT	2		
5120-541-2938	/ /	WRENCH, OPEN END FIXED: F/ant and pedestal Armstrong type No. 1256			2		
		ANTENNA AS-847/FPS					
		NO PARTS AUTHORIZED FOR STOCKAGE AT OPERATOR'S LEVEL.					
		ANTENNA AS-1308/FPS					
		NO PARTS AUTHORIZED FOR STOCKAGE AT OPERATOR'S LEVEL.					

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
											FIGURE NO.	ITEM NO.
							OA-6957/FPS-71 (continued)					
							ANTENNA AS-1748/FPS					
							NO PARTS AUTHORIZED FOR STOCKAGE AT OPERATOR'S LEVEL.					
							AMPLIFIER, ELECTRONIC CONTROL AM-4497/FPS					
5960-262-0152	/	/					ELECTRON TUBE: MIL type 6AU6 WA			1		
5960-296-3420	/	/					ELECTRON TUBE: MIL type 6216			1		
5920-281-0209	/	/					FUSE, CARTRIDGE: 3 amp, 250 V; MIL type F0263R00A			5		
							REDUCED VOLTAGE STARTER Model No. AP-133					
	/	/					FUSE, CARTRIDGE: MIL type #F09GBR00B (M4RC8-A012)			5		
							PEDESTAL ANTENNA AB-876/FPS-71 and PEDESTAL ANTENNA AB-651/FPS-69					
							NOTE: Model Column 1 refers to AB-876/FPS-71; Column 2 refers to AB-651/FPS-69					
5925-557-4089	/	/					CIRCUIT BREAKER: 1.7 amp, 600 ac; Raytheon P/N 2631-1278G2			1		
5920-131-9893	/	/					FUSE, CARTRIDGE: 2.2 amp, 250 V; Buss Type No. FNM-2			5		
5920-199-4022	/	/					FUSE, CARTRIDGE: 8 amp, 250 V; Buss Type No. FNM-8			5		
5920-190-7325	/	/					FUSE, CARTRIDGE: 10 amp, 250 V; Buss Type No. FNM-10			3		
5920-699-1926	/	/					FUSE, CARTRIDGE: 15 amp, 250 V; Buss Type No. BAN-15			3		
5920-583-7980	/	/					FUSE, CARTRIDGE: 30 amp, 250 V; Buss Type No. FNM-30			5		
5920-280-3181	/	/					FUSE, CARTRIDGE: 60 amp, 250 V; MIL type No. F16G60R0B			5		
6240-223-9100	/	/					LAMP, GLOW: GE type No. 51			2		

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By Order of the Secretary of the Army:

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